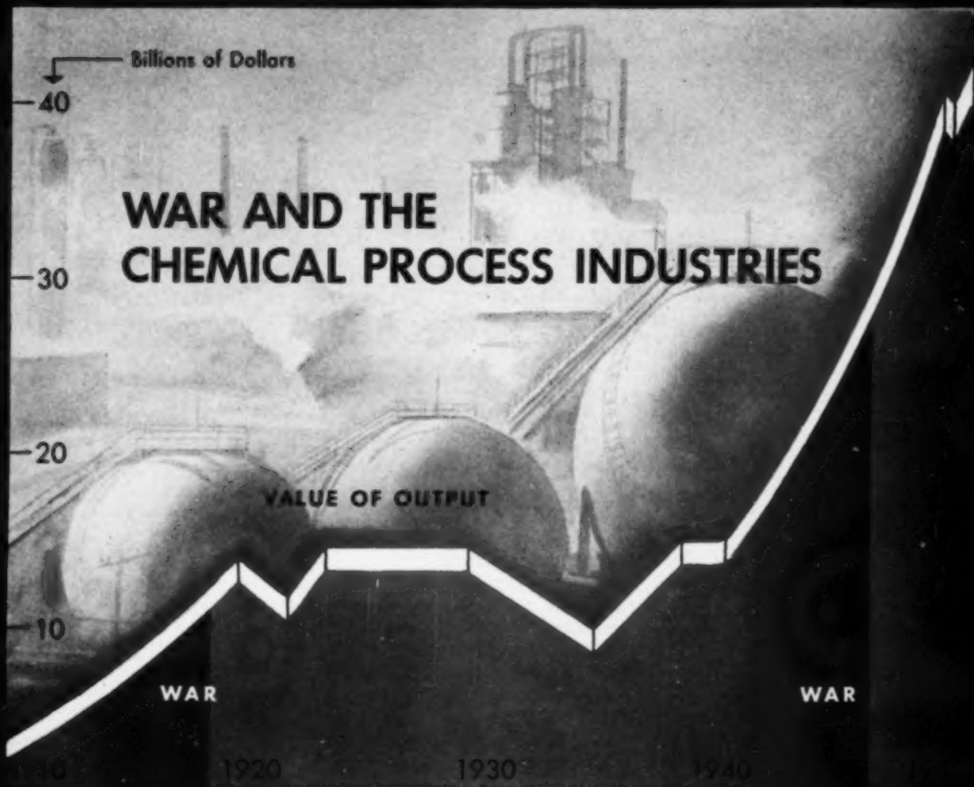
Chemical Engineering

FEBRUARY 1951



OUTLOOK FOR THE CHEMICAL PROCESS INDUSTRIES THIS YEAR AND THE NEAR FUTURE. HOW THE CPI WILL BE INFLUENCED BY LAST YEAR'S EVENTS. **PAGE 111**

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ONE DOLLAR

FEBRUARY 1951

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

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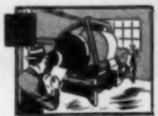
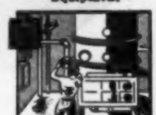

Analysis of Requirements


Design and Layout


Manufacture of Equipment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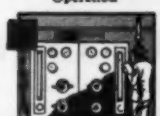
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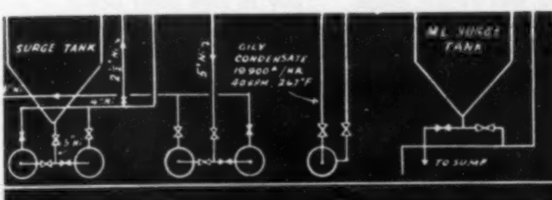

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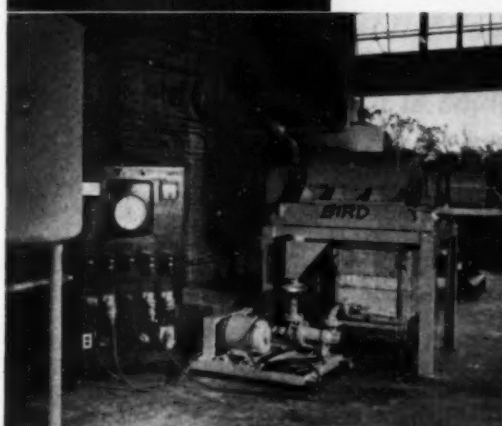

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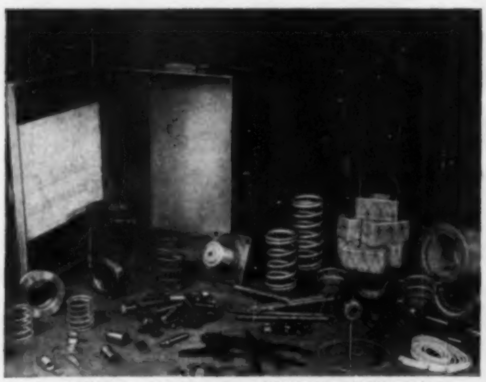

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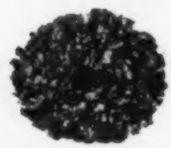

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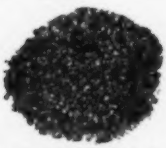
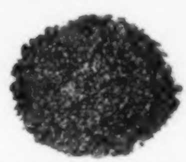


REFRIGERATION SIZE



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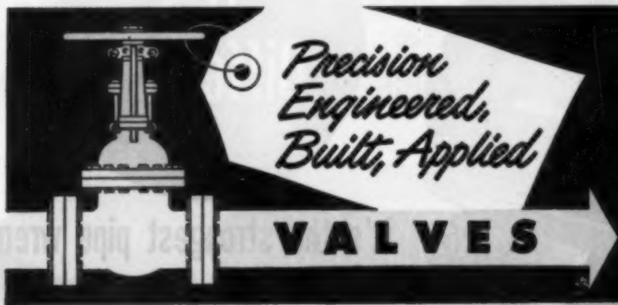

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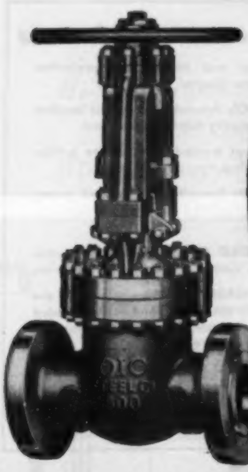

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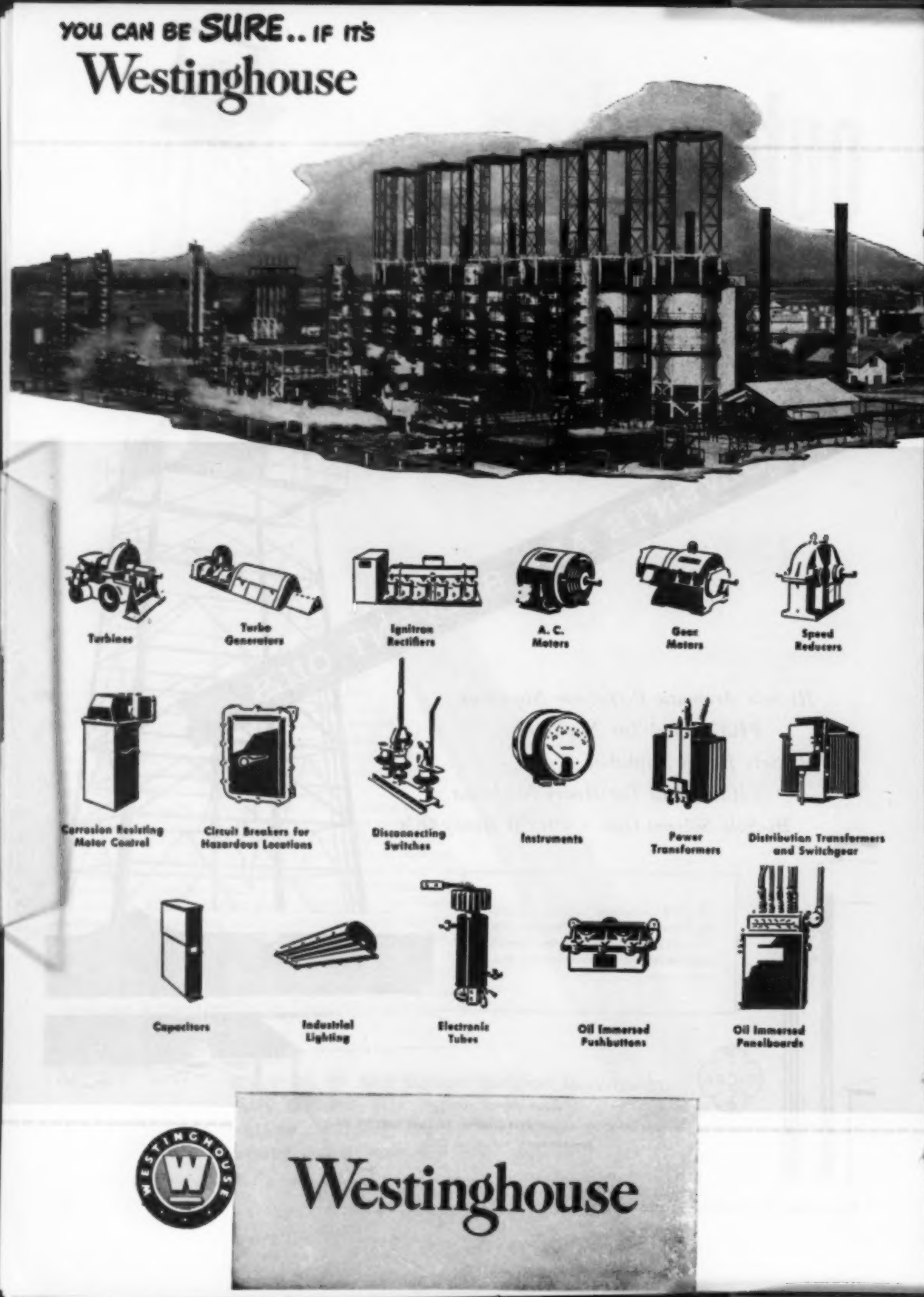
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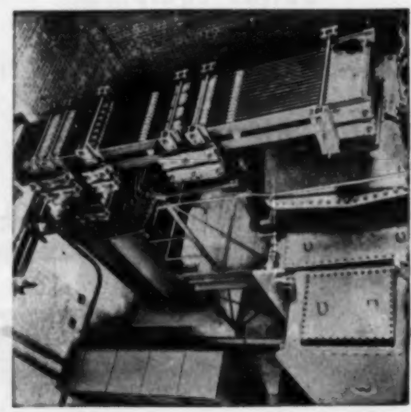
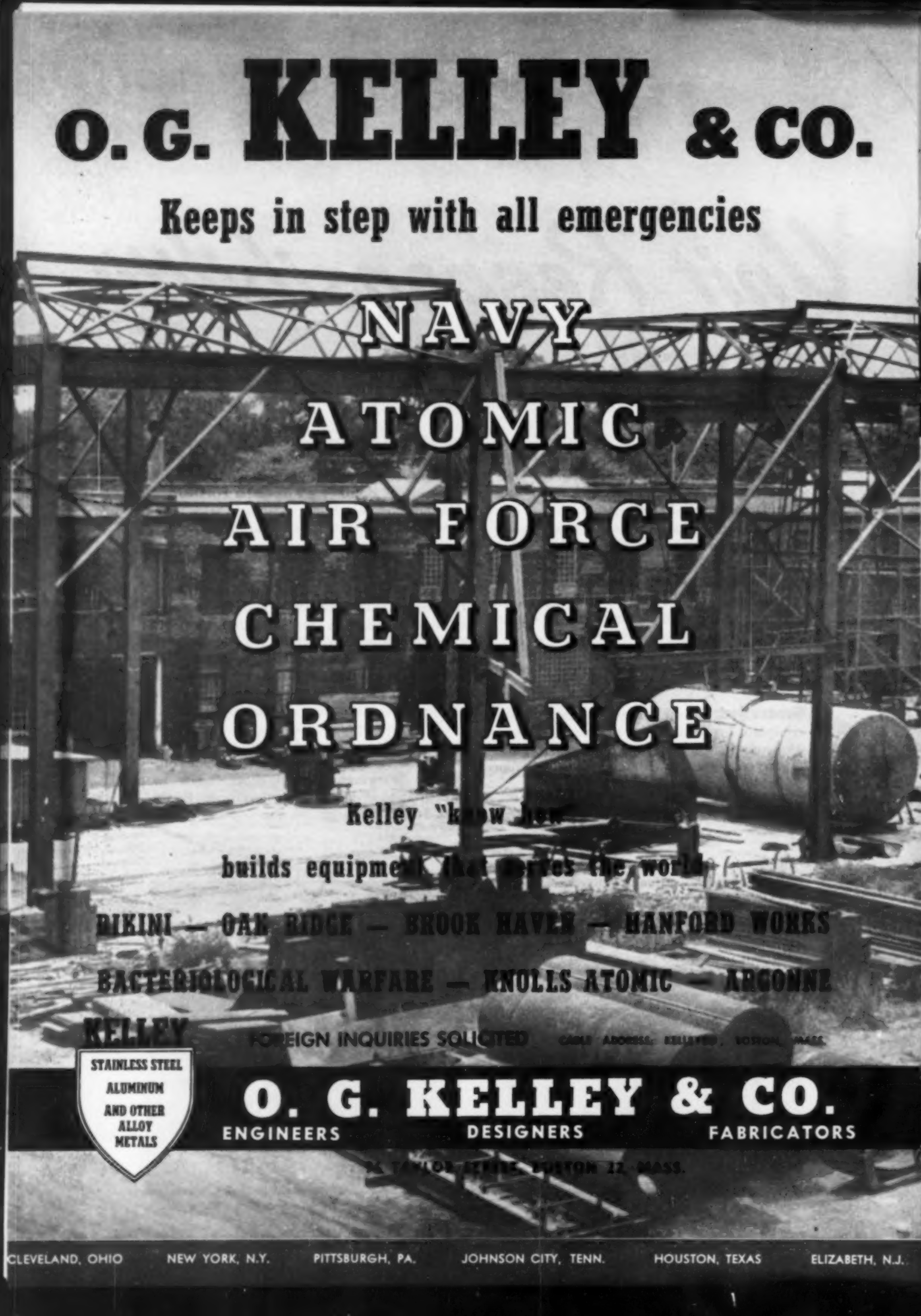
(Below) Westinghouse Ignitron Rectifiers provide large blocks of rectified power. They carry heavy loads continuously, at full capacity, with safety and at low maintenance cost. *(Right)* Without this 40,000-ampere-series resonance furnace circuit, developed by Westinghouse, the power factor would have been 30%. In this chemical plant installation, use of the series transformer reduced installation cost and raised power factor to unity.

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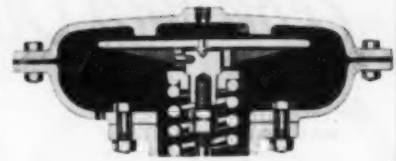

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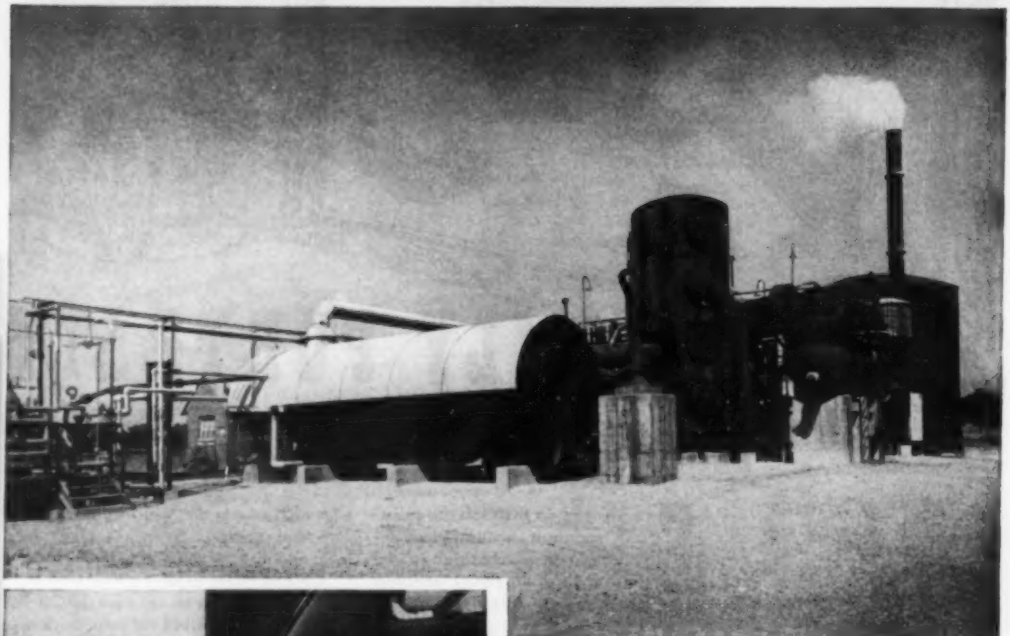

CHEMICO BUILDS NEW TYPE CONTACT PLANT for Cyanamid at Hamilton, Ohio. The new plant has been designed by engineers of the Chemical Construction Corporation, a unit of Cyanamid, to produce sulfuric acid of any strength up to 93% H_2SO_4. Based on a completely new process, this plant is typical of many designed and built by Chemico for the production of heavy chemicals or synthetic fertilizers. It eliminates seven costly pieces of equipment found in older methods; raises conversion efficiencies to a high of 99%.

WINTER DRIVING IS SAFER, snapped links are fewer, and tire chains last longer, when the links are treated with Cyanamid's AEROCASE® Case Hardening Compounds. This treatment adds extra miles to the life of tire chains by increasing the carbon and nitrogen content of the metal, giving it a hard, tough case. For more information on how AEROCASE can improve your metal products, mail the coupon.

Chemical Newsfront

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- Dipropionitriles
- 2 Nitrodiphenylamine
- Propionitriles (Subst.)
- Propylamines (Subst.)
- Sodium Dicyanamid

Cyanamid's Nitrogen Chemical Digest Volume V, Acrylonitrile

This book contains pertinent facts on the properties and applications of Acrylonitrile, the compound that has been making chemical news in rubber, synthetic fiber, and other fields. It makes available for the first time, under one cover, an up-to-date review of this subject. Supply of these books is limited.

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- ☐ TANAK Synthetic Tanning Agents
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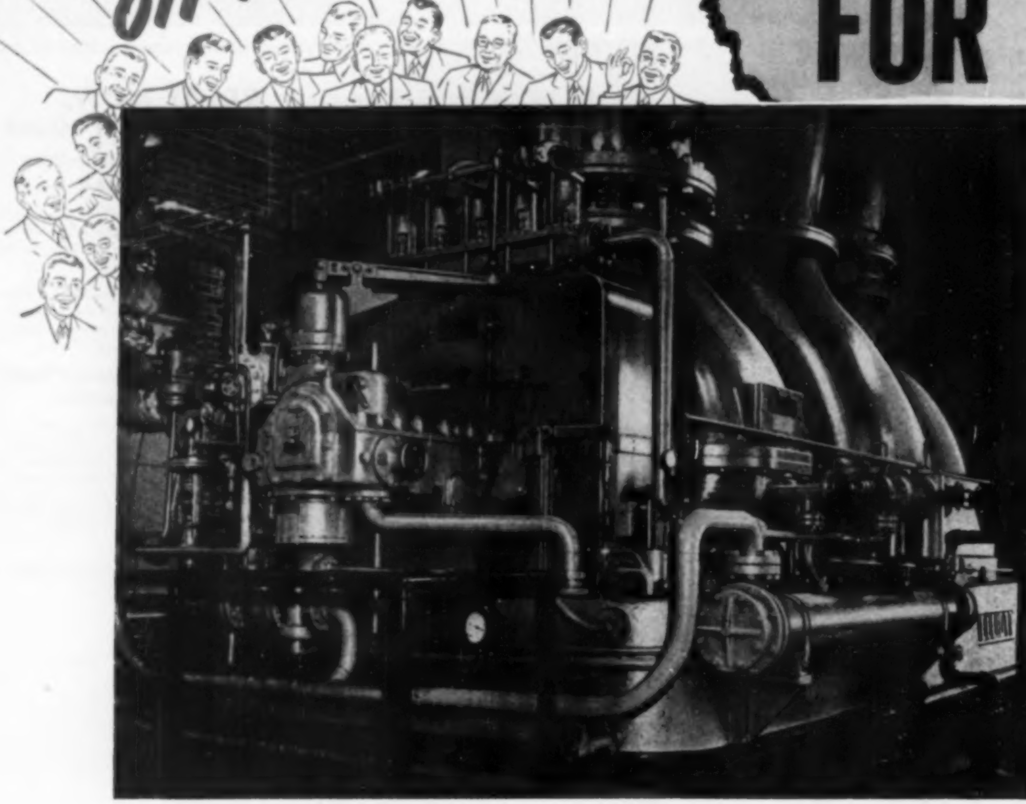


NEARLY TWO YEARS WITHOUT STOPPAGE

The Elliott turbine-driven centrifugal blower, which contributed to this outstanding record, has a capacity of 50,100 inlet cfm and discharges at 15 psig; the driving turbine develops about 3500 hp at 3740 rpm. Blower provides air for catalyst regeneration and for circulation of catalyst at a rate of 1200 tons per hour.

ELLIOTT COMPANY

Centrifugal Blower Dept.,

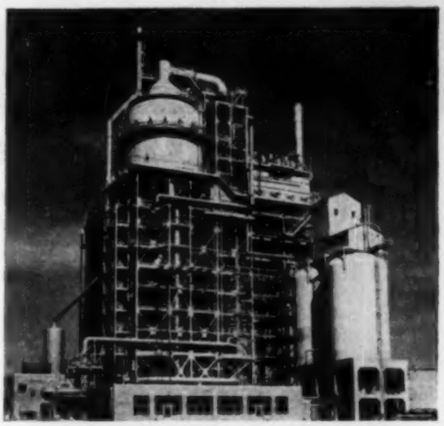
RECORDS BROKEN NON-STOP OPERATION

THE ELLIOTT BLOWER pictured at the left, located at the Sunray Oil Corporation plant, Sunray, Okla., near Duncan, is helping to make history in fluid catalytic cracking. Starting operation in March, 1949, it has already exceeded all previous long-run records and, up to Jan. 1, had piled up the amazing total of 665 days with no evidence of fatigue or drop in efficiency. This operating record is a real tribute to the equipment making up the cat cracker unit and to the operating personnel of the refinery.

This is the second Elliott blower to carve itself a niche in the industrial hall of fame. The previous non-stop record in catalytic cracking, 610½ days, was also made with the aid of an Elliott blower at the refinery of the Tidewater Associated Oil Company, Avon, Calif. *It takes an Elliott blower to beat an Elliott blower.*

In many other refineries Elliott blowers, driven by Elliott turbines or motors, are demonstrating their dependability — contributing savings instead of maintenance costs. If you value this type of performance, check with Elliott engineers regarding your own specific requirements.

It should be added that numerous Elliott mechanical drive turbines are also a part of this cat cracker unit, contributing their share to the non-stop run.



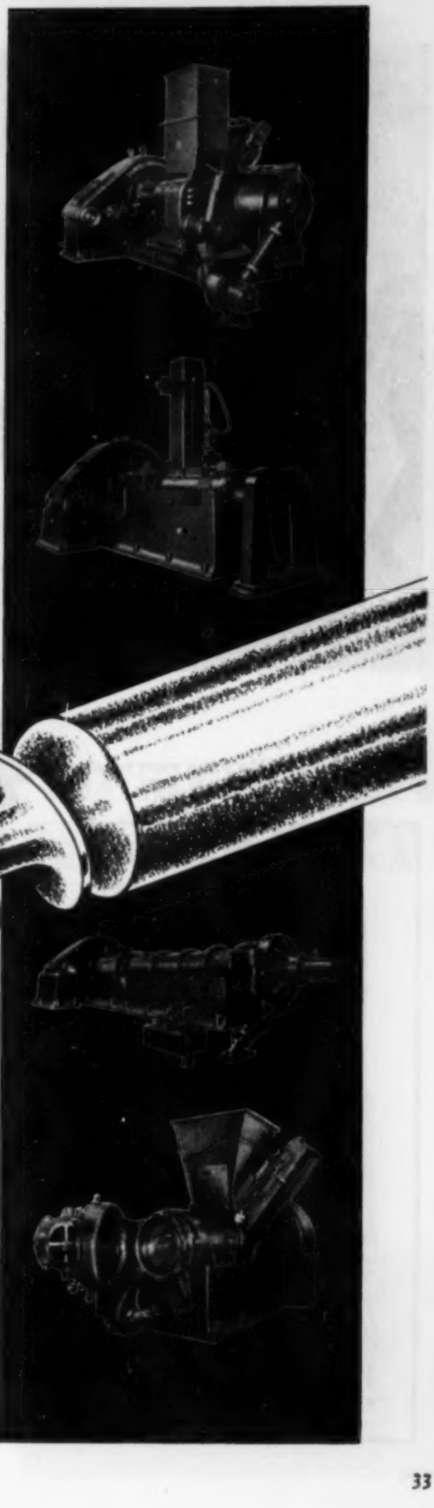
The fluid "cat cracker" at Sunray Oil Corporation, Sunray, Oklahoma, was originally built and operated by Associated Refineries, Inc. during World War II. After remaining idle for several months, the refinery was purchased by Sunray in 1947 and was again put on stream in the spring of 1948. It has now been in continuous operation since March, 1949.

P-1091

JEANNETTE, PA. PLANTS AT: JEANNETTE, PA. • RIDGWAY, PA. AMPERE, N.J. • SPRINGFIELD, O. • NEWARK, N.J. DISTRICT OFFICES IN PRINCIPAL CITIES

FARREL-BIRMINGHAM EXTRUDERS

for specialized production



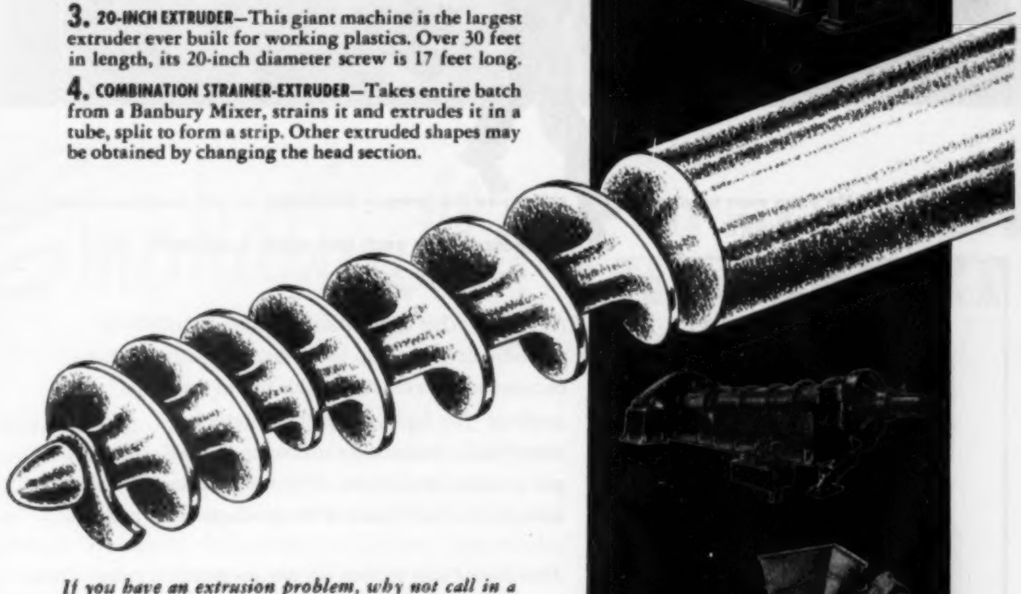
Farrel-Birmingham Extruders are designed to meet individual requirements for special extruding jobs. Take these four machines, for example.

1. **HALE PELLETIZER**—Produces free-flowing rubber pellets which provide more efficient and economical handling and storage, quicker processing and more uniform quality.

2. **GORDON PLASTICATOR**—Specially designed for breaking down rubber. Improved plasticity and high productive capacity at low cost characterize its performance.

3. **20-INCH EXTRUDER**—This giant machine is the largest extruder ever built for working plastics. Over 30 feet in length, its 20-inch diameter screw is 17 feet long.

4. **COMBINATION STRAINER-EXTRUDER**—Takes entire batch from a Banbury Mixer, strains it and extrudes it in a tube, split to form a strip. Other extruded shapes may be obtained by changing the head section.



If you have an extrusion problem, why not call in a Farrel-Birmingham engineer for consultation?

FARREL-BIRMINGHAM COMPANY, INC.

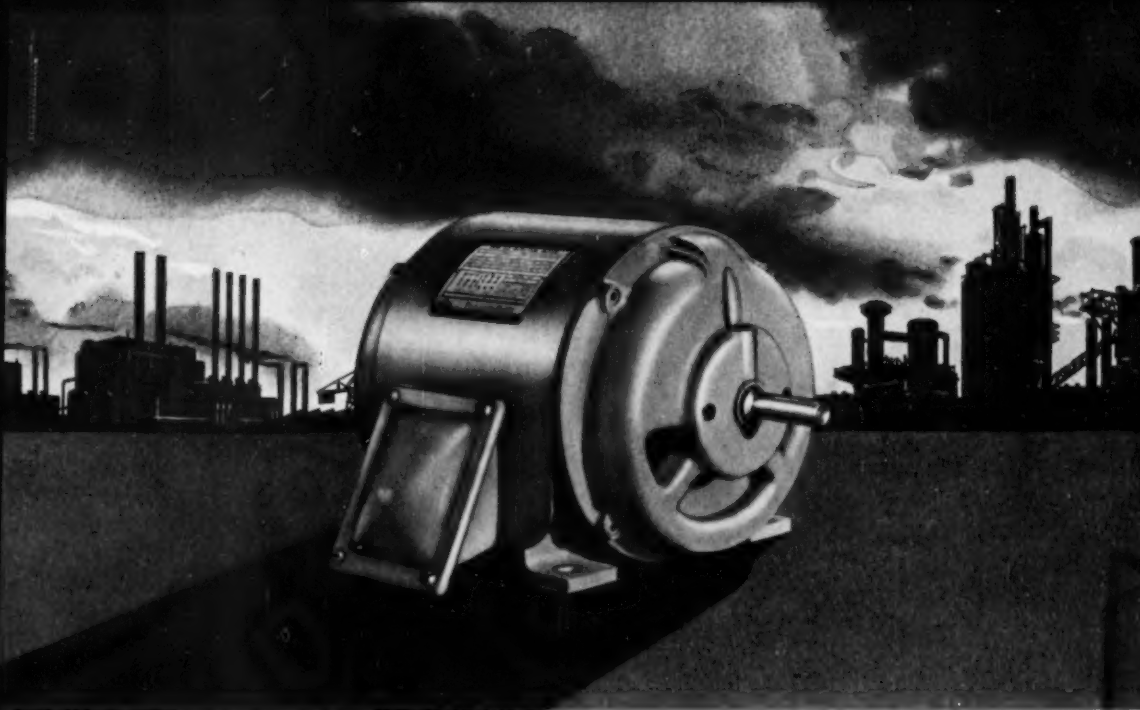
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-652



WHICH TRENTWELD TUBING FITS YOUR NEEDS?

full finished tubing and pipe sizes

large diameter tubing

ornamental tubing

beverage tubing

Whatever your industrial requirement . . . pressure tubing, stock line tubing, decorative tubing, cooling coils, sanitary beverage tubing . . . the complete TRENTWELD line of quality stainless and high alloy tubing is your best bet! TRENTWELD is made in a *tube* mill by *tube* engineers . . . and is designed for rugged dependability, long life and economical service.

Trent Tube Company *specializes* in the production of stainless and high alloy tubing . . . and that means you get expert advice on applying TRENTWELD to your needs. And you get fast service on delivery because of Trent's convenient mid-continent location. You're assured of finding what you need . . . the complete TRENTWELD line ranges from 1/8" to 30" diameter inclusive.

To meet your stainless or high alloy tubing requirements . . . better . . . TRY TRENTWELD! Write for TRENTWELD Data Bulletin.

TRENT TUBE COMPANY
Subsidiary of Crucible Steel Company of America
General Offices and Plant: East Troy, Wisconsin
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TRENTWELD

STAINLESS STEEL TUBING

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

"DUST STORM". Abrasive dusts sprayed on the Type E, while operating at full speed, for extended periods, fail to impair operation. In these tests, none of the abrasive entered the bearing housing . . . governing and overspeed-trip mechanisms continued to operate freely.

Defies dust and dirt

Depend on the general-purpose Type E Turbine for the kind of service you want . . . whenever and wherever you want it.

Prolonged exposure to abrasive dusts fails to more than dirty up the outside casing. Type E construction keeps foreign matter out, and eliminates close-sliding fits. Materials used in construction resist corrosion and erosion . . . you get a turbine that's *rugged.*

Investigate these, and all the other vital features wrapped up in industry's *standard* turbine . . . the Type E. Get complete information from your nearby Westinghouse office, or write for your copy of the Type E Turbine Book, B-3896. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-50500-A

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TYPE E

Turbines

—in drums equipped with

The Atlas Lubricant Corp. in New Orleans ships thousands of drums every month to most of the world's markets. And every one of these Atlas drums leaves the plant with its contents *sealed safe* by Tri-Sure Closures*.

Atlas, one of the first users of all-lithographed drums, has made Tri-Sure protection a *must* for its fine motor oils and lubes. The result is that Atlas products are always secure—all over the world—from leakage, seepage, tampering and undetected pilferage.

Give *your* products the protection that the world's leading shippers have *proved* dependable—the Tri-Sure *flange, plug* and *seal*. On your next drum order, specify "Tri-Sure Closures". Your supplier will deliver your drums equipped with Tri-Sure flanges and plugs; you apply the seals.

Tri-Sure

CLOSURES

**The "Tri-Sure" Trademark is a mark of reliability backed by 28 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.*

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

Of Special Interest To Large Users of Polyols...

ATLAS Is Doubling Its Capacity For SORBITOL Production To Meet Increased Demands

The job is planned for completion in late 1951. So *now* is the time to re-evaluate the significance of sorbitol in the field of polyols (polyhydric alcohols) . . . the time for producers of tobacco products, resins, cellulose films, explosives, and the like to plan for the day when the supply of sorbitol will be ample for their needs.

There is no conditioner like sorbitol! It is not a substitute for anything, but possesses outstanding advantages all its own. It is the one polyol whose price trend has been steadily downward while quality and availability have improved. That's why more and more manufacturers of adhesives, printers' rollers, pharmaceuticals, cosmetics, confections, cork, gaskets, and paper products turn to sorbitol as the polyol least subject to supply and price fluctuations.

Sorbitol belongs to the same polyol family as glycerin and the glycols. However, its *six* hydroxyl groups, its higher viscosity, and its lower rate of moisture gain or loss make it unique and advantageous in many industries.

Atlas research and technical service will be glad to work with you in planning your research to take advantage of sorbitol's availability at stable prices. Write *now* for the latest information on sorbitol's advantages and methods of application in your own industry.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

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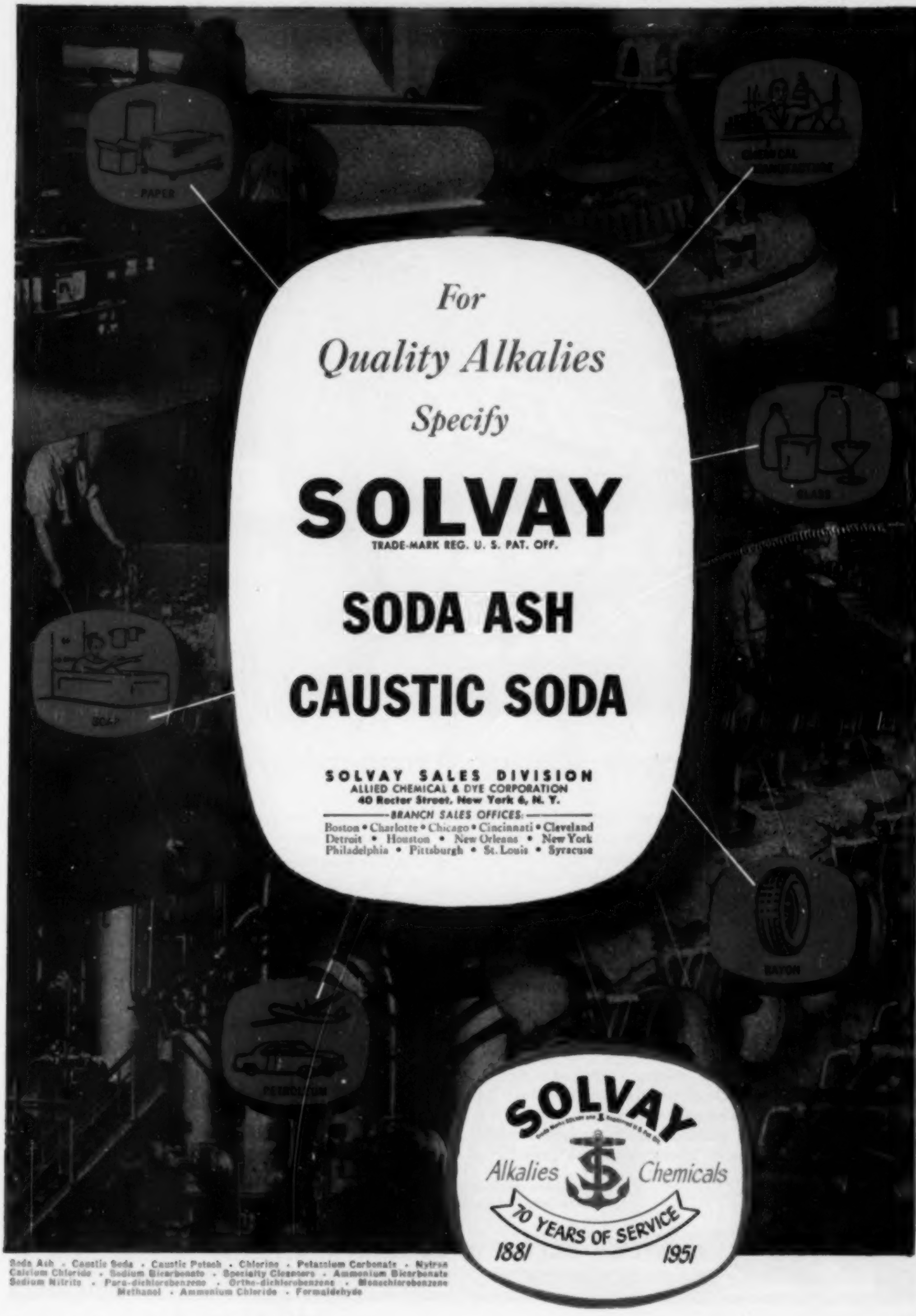
ATLAS POWDER COMPANY, CANADA, LTD., Brantford, Canada



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Methanol • Ammonium Chloride • Formaldehyde

Let You Forget About Atmospheric Hazards

Shown here are four basic types of Century Protected Motors which are designed to resist the dangers of hazardous atmospheres. A properly selected Century motor—with the right protection—is the ideal combination for a long life of satisfactory performance.

1 Open Protected—Form J, general purpose motor—meets the needs for most installations where operating conditions are relatively clean and dry. The top half of the motor frame is closed to keep out falling solids or dripping liquids.

2 Splash Proof Motor—gives the necessary protection where plants must be washed down—keeps water out of the motor even when a hose is applied directly on the frame. It also provides protection against rain, snow, sleet and ice for outdoor installations.

3 Totally Enclosed Fan Cooled Motor — protects against dusts, mist or fog that might be detrimental to the vital parts of the motor. The inner frame protecting the motor is sealed to keep out harmful matter.

4 Explosion Proof Motor — protects against atmospheres charged with explosive dusts or gases. They carry Underwriters' label for specific kinds of hazards.

Century builds a complete line of alternating and direct current motors in a wide range of types and kinds—in sizes from 1/6 to 400 horsepower.

Specify Century motors for all your electric power needs.

Popular types of standard ratings are generally available from factory and branch office stocks.

Century Electric Company is celebrating its 50th year in the electrical industry.

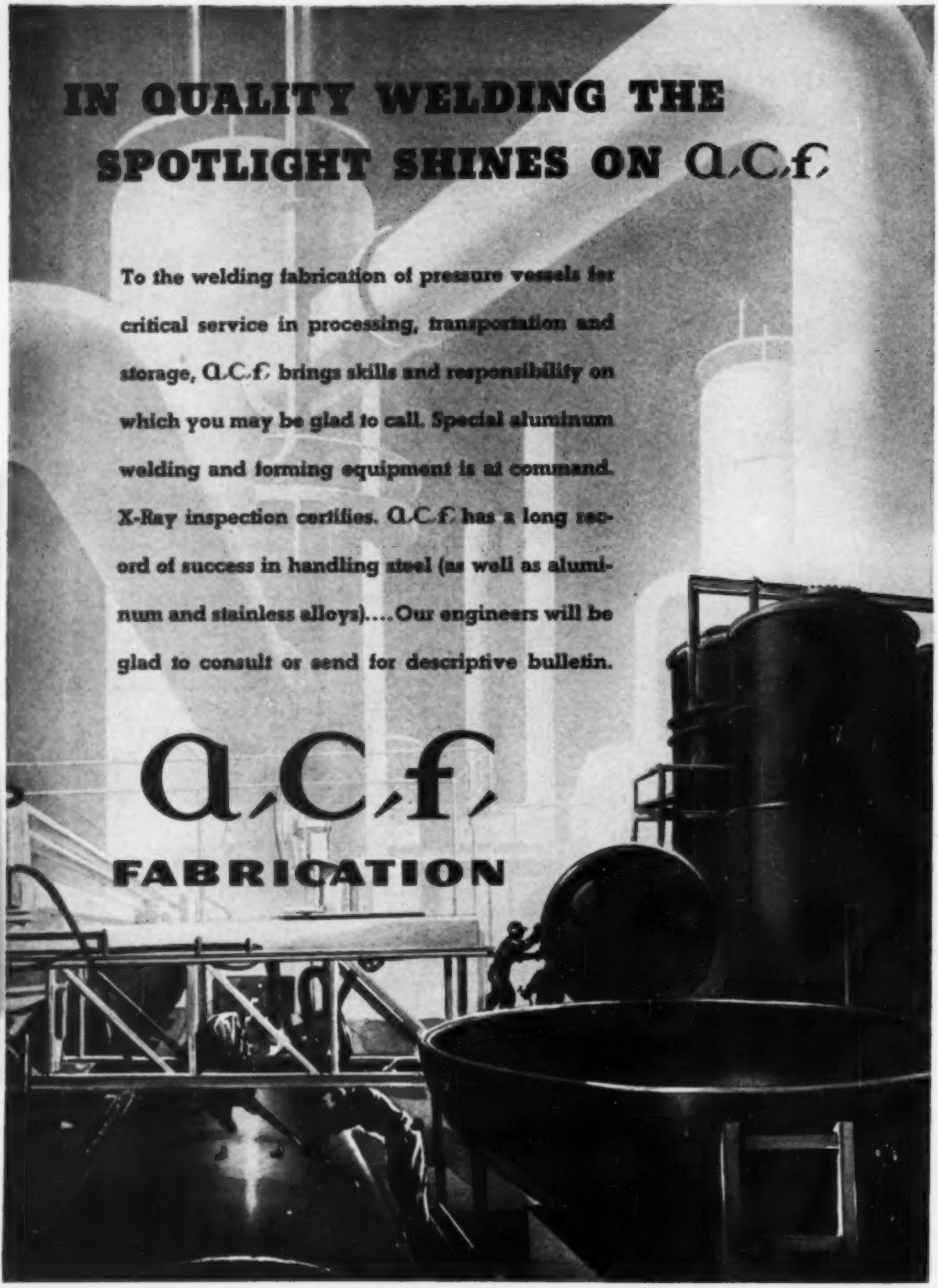
Century C Motors

-932

CENTURY ELECTRIC COMPANY 1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities


You can't install a *better* valve than a
POWELL
VALVE
—there IS no better!
Over a century of concentration on making one—and only one—kind of equipment must have a definite result. With Powell, the result is not only an amazingly complete* line of valves for industry but also the *best* valves it is possible to make.
*Powell makes the most complete line of valves specifically adapted to the Chemicals and Process Industries. They are in Bronze, Iron, Steel and the greatest selection of Corrosion-Resisting Metals and Alloys ever used in making valves.
Quality fine throughout "The Line"
[illegible] new 150-pound O. S. & Y. Gate Valve available in a wide selection of corrosion-resisting alloys. Made with either flanged or screwed ends in sizes ½" to 2", inclusive. All dimensions of flanged end valves con[illegible] MSS Standard SP-42.
POWELL
The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio



American Car and Foundry Company, Tank and Pressure Vessel Department, 30 Church Street, New York 8, N. Y.
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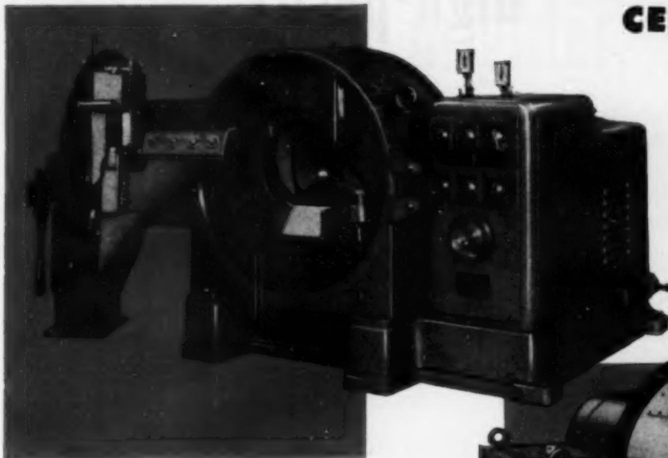
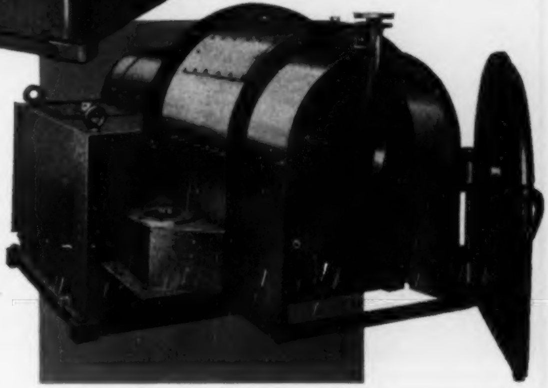
THERE'S A
BAKER PERKINS
MACHINE FOR EVERY CENTRIFUGE JOB



Each of the two types of *Baker Perkins* "ter Meer" Centrifugals is available in several sizes, with capacities to handle any filterable slurries. So, regardless of the material you have to be centrifuged, there's a *Baker Perkins* machine to do it.



The Baker Perkins Type HS Universal Filtering Centrifugal is invaluable for centrifugation of a wide range of filterable solid-liquid slurries. Fully automatic, it requires no operators' attention, but manual control can be provided when desired. A simple trouble-free cycle controller makes complicated centrifugation cycles easy. The control cycle compensates easily for process variables. Maintenance costs are cut by easy filter media change and the fact it will use almost any available filter media. The constant speed drum rotation means savings in power costs.

The Type S Baker Perkins Continuous Centrifugal is ideally suited to centrifugation of a wide range of relatively free draining crystalline, granular and fibrous materials. Truly continuous in operation, it requires no timing or cycle controllers for feeding or other action. The Type S Centrifugal is particularly suited to handling friable material because there are no scrapers, baffles, rakes or plows in the machine to cause crystal disintegration. This B-P machine is economical in operation because its constant speed drum rotation requires very low power input and the rugged design calls for little maintenance other than oiling of the electric motor.

Both of these *Baker Perkins* Centrifugals are available in varying sizes to meet every production requirement as well as laboratory or pilot plant application. Write for catalog C-49 . .

BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION • SAGINAW, MICHIGAN

New "MIDGET SUBSTATION" makes lamps burn brighter, last longer

G-E INDUCTROL POWER PACK

combines breaker, transformer, regulator in one convenient package

If your plant has combined light and power circuits, you may have noticed how illumination can fall off during plant load peaks. You may also have had trouble with shortened lamp life due to overvoltage.

In either case, here's a brand new "packaged" answer to better voltage regulation—the G-E Inductrol Power Pack.

The new Inductrol unit is, in effect, a midget load-center substation, combining circuit breaker, transformer, and induction voltage regulator in one convenient, space-saving package. It takes the 480 or 600 volts from your power line and converts it to the uniform 120 volts required for maximum lamp output and life. For greater production, more accurate testing, and better performance of electronic equipment, investigate the new G-E Inductrol Power Pack. Contact your G-E sales representative, or authorized G-E agent—or mail your coupon today. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

G-E Inductrol Power Packs on factory's roof stanchions are housed in attractive, completely metal-enclosed, easily installed cabinets.

INDUCTROL POWER PACK

General Electric Co., Section C 321-73
Apparatus Department
Schenectady 5, N. Y.

Please send me Bulletin GEA-5571 on the new G-E Inductrol Power Pack.

Bulletin needed for:

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GENERAL ELECTRIC

BROWN INSTRUMENTATION

THE MODERN

The instrument installation at the Deer Park plant is a major engineering job in itself. The control room (shown above) houses instrument panels totalling nearly one hundred feet in length. There are recorders, indicators, controllers, cutouts, relays, switches and many other instruments—comprising an interlocking system that synchronizes all phases of the process

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

Background for better detergents

More than a billion pounds of household and industrial cleaning compounds have been produced with synthetic detergent materials made by Oronite.

This broad acceptance is proof of the high regard which leading compounders, processors and end-users hold for Oronite products.

Large-scale production facilities and experience provide Oronite the background for better detergents and make Oronite a most important source of supply.

A partial list of other Oronite Chemicals

NOTICE
Some of the following are currently in short supply.

Detergent Alkane
Detergent Slurry
Detergent D-40
Detergent D-60
Wetting Agents
Lubricating Oil Additives
Cresylic Acids
Gas Odorants
Polybutenes
Sodium Sulfonates
Purified Sulfonate
Naphthenic Acids
Phthalic Anhydride
Ortho, Para Xylenes
Xylol
Aliphatic Acid
Hydroformer Catalyst

THESE EXTREMELY VERSATILE SYNTHETIC DETERGENTS FIND A WIDE VARIETY OF USES THROUGHOUT INDUSTRY

Four Examples:

1. FOOD AND VEGETABLE PROCESSING
A tremendous aid in washing, peeling and processing fruits and vegetables before canning or freezing. Improves their marketability and aids in the removal of dirt, insecticide and fertilizer residue.

2. CEMENT AND PLASTER INDUSTRIES
In the cement and plaster industries these surface active detergents are used to improve workability and plasticity, reduce abrasive wear on mixing equipment, facilitate "stripping" from molds or forms, improve texture and reduce water requirements—all of which contribute to lower costs.

3. CLEANING AND WASHING COMPOUNDS
Oronite supplies tremendous quantities of synthetic detergent materials to processors and compounders of packaged cleaners for all household and industrial uses.

4. TRANSPORTATION EQUIPMENT WASHING
Because of its fast action, quick rinsability and high detergency, Oronite D-40, either alone or in compounds, cuts cleaning and maintenance costs on trucks, trains, busses, passenger cars and other types of rolling stock.

ORONITE CHEMICAL COMPANY

38 SANSOME STREET, SAN FRANCISCO 4, CALIF. STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y. 600 S. MICHIGAN AVENUE, CHICAGO 5, ILL.
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WE HAVE BEEN ASKED:

"What is the best finish for an outdoor boiler?"

A letter we received recently stated:

"We plan to install our new boiler outdoors, and we have a question about the best finish to use. The boiler will be insulated with 85% Magnesia Block. What type of finish would you recommend, taking into consideration both cost and durability?"

We advised two coats of Armstrong's Insulmastic as a finish for this boiler because it is less expensive than many other finishes that are suitable for outdoor applications. Also, it does not crack in cold weather or soften in summer's heat and has unusual durability under wind, rain, and snow. It requires only periodic painting with aluminum or Armstrong's No. 3 Asphalt Paint. However, for best results the Insulmastic must be applied properly.

After the Magnesia Block has been installed, a layer of hexagonal mesh should be secured in place, and one coat of asbestos cement troweled on to an even surface. Next, a second layer of mesh is applied over the plaster and two coats of Insulmastic troweled on to a smooth, even finish. Should the boiler be in a busy area where it might be subjected to damage, it's wise to erect bump rails for protection.

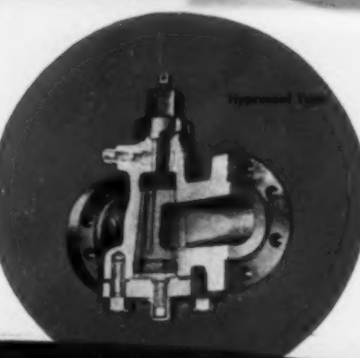
Almost every job presents problems that must be well thought out if the insulation is to be truly effective. Armstrong's engineers are ready to help tailor your insulation specifications to meet your requirements. In addition to the advice of highly trained engineers, Armstrong offers a complete Contract Service with skilled workmanship and highest quality materials.

IF YOU HAVE ANY QUESTIONS on the construction of high-temperature or low-temperature equipment, please do not hesitate to write to us. We'll do our best to give you a practical answer. Just address a letter or post card to Armstrong Cork Company, 3302 Maple Avenue, Lancaster, Pennsylvania.

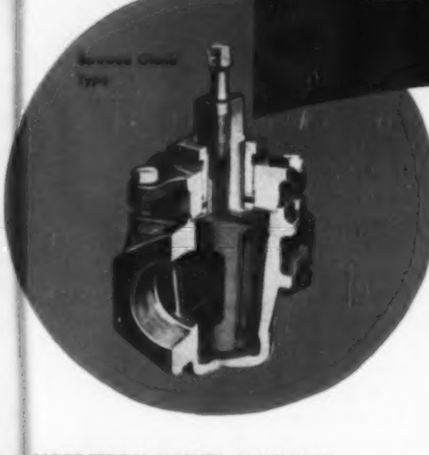
ARMSTRONG'S INDUSTRIAL INSULATIONS

MATERIALS · INSTALLATION

FOR ALL TEMPERATURES FROM 300°F. BELOW ZERO TO 2800°F.



Bearing the burden of control ON THE *Toughest* LINES . .



A tapered, lubricated plug valve is superior to any other valve design for chemical lines—because its seat is never exposed to the line. In conventional valves the exposed seat eventually corrodes or erodes. In Nordstrom valves the plug is tapered to insure closely-fitted seating. The seat is lubricated and will not gall. The ports are sealed with pressurized lubricant. The passageway presents a flush surface so that nothing in the line can lodge within the valve or intrude upon the seat. For handling extremely erosive fluids the plug and body seats are Merchrome coated with hard-facing. You can install Nordstroms on the hottest or the coldest lines and they will operate as efficiently as on normal lines. Special types of valve lubricants have been developed for specific chemical services. Use Nordstroms on every tough line in your plant for leak-free, corrosion-free performance.

LUBRICATION is a "must" to seat a valve tight

ROTARY ACTION, MOST POSITIVE CONTROL

Simplest valve design is a tapered plug. When properly lapped and fitted, it forms a tight closure, but it must be lubricated to insure easy turning and tight sealing.

PLUG SURFACE SEATED ON LUBRICANT FILM

The Nordstrom valve employs pressurized lubrication which evenly distributes a film over the entire seating surface, which is never exposed to the line. Easy turning is assured.

POSITIVE PRESSURE SEAL AROUND EACH PORT

Nordstrom "Sealdport" lubrication, by ingenious locating of connecting grooves in the plug and body, forms a pressure seal around each port which prevents internal and external leakage.

HYDRAULIC JACKING ACTION FREES PLUG

A few turns of the external lubricant screw regenerates pressure. If the plug is too tight to turn easily, a few extra turns of the screw hydraulically jacks the plug, freeing and lubricating it.

NORDSTROM VALVES AVAILABLE IN SEMI-STEEL, NORDCO STEEL AND ALLOYS TO FIT THE CHEMICAL NEED

4-6% CHROMIUM—½% MOLYBDENUM—an alloy steel of high physical properties which also possesses excellent resistance to corrosion and used mainly for high temperatures, particularly for petroleum refinery operations.

IMPACT RESISTING ALLOYS—for sub-zero temperatures. These are cast, low carbon nickel alloy steels, specially heat-treated for use at sub-zero temperatures.

PURE NICKEL—offers the best resistance of any of the common metals toward caustic alkalies and is particularly resistant against hot concentrated solutions of caustic soda.

MONEL—a high nickel alloy containing about 70% nickel, 29% copper and a small amount of iron and other elements. Its physical properties place it in the range of steels as regards strength and ductility.

MERCOLOY—a nickel bronze, very resistant to strong acid and alkaline solutions. It finds wide use in handling hot concentrated caustic solutions, refinery sludge acid and super-heated steam.

NI-RESIST—the cheapest alloy for mildly corrosive services. It is a cast iron alloy containing nickel, copper and chromium. It is resistant to dilute sulphuric acid and other mildly corrosive agents. In certain types of technical service, particularly caustic evaporation, a copper-free Ni-Resist containing up to 30% nickel is being used.

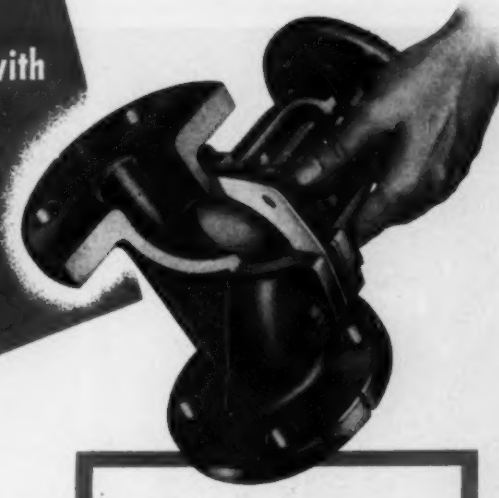
STAINLESS STEELS—a wide variety is available, the principal types containing about 18% chromium and 8% nickel, and that containing 12% to 18% chromium and of very low carbon content. The 18-8 alloy is extremely soft but when specially constructed with use of the Nordstrom Merchrome coating process, presents the most durable valve, free from galling and highly resistant to corrosion and erosion.

MERCO BRONZE—widely used primarily because of its satisfactory acid-resisting characteristics. It is a copper-tin-lead bronze commonly referred to as an 88-1-3 Bronze. It has good resistance to sulphur dioxide and sulphurous acid solutions, as well as weak sulphuric acid. It is suitable for services in sulphite pulp mills for handling acid liquor; also for acetic acid, salt water, etc.

PROVED IN PERFORMANCE

Grinnell-Saunders Valves with CHEMICALLY INERT KEL-F* DIAPHRAGMS

Pat. App. For



Grinnell-Saunders Diaphragm Valves with **KEL-F** Diaphragms are living up to every promise made for them! At the right are reports from typical users.

KEL-F's resistance to chemical action, low cold flow, wide range of temperature application and exceptional flex life combine to make it the most important diaphragm development in years. **KEL-F** is chemically inert to all organic acids and alkalies in all concentrations. It withstands chlorinated aliphatic and aromatic compounds, concentrated nitric, chromic, hydrofluoric and sulphuric acids and most solvents which readily attack rubber and previous synthetic diaphragm materials.

While **KEL-F** is tough and flexible, it is not resilient. To provide resiliency for proper closure of the valve and to provide added support for the **KEL-F** diaphragm, it is backed with a rubber cushion. A free-floating method of attachment to the compressor assures an even closing pressure on the entire surface of the weir. A tube nut which floats as the rubber cushion presses down in closing the valve, eliminates excessive pressure on the diaphragm stud. The rubber cushions the closing force, thereby reducing wear and cutting action on the diaphragm. In accelerated tests, a 2-inch valve with a **KEL-F** diaphragm withstood over 80,000 closures, drop tight, against 80 pounds of air under water with no leakage and no visible signs of wear. Write for complete information.

Typical performance reports . . .

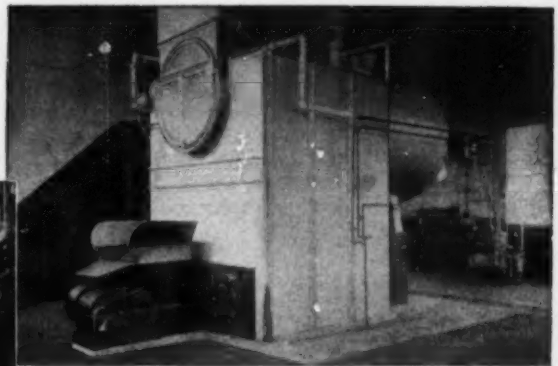
1. Chlorine and HCl gas with small amounts of acetic acid and acetyl chloride at 302° F. for 900 hours. Very much superior to material it replaced.
2. Mixed aromatic and ketone solvents at 230° F. and 10 psi for three months. No sign of deterioration.
3. Chlorinated organic chemical at 158 to 194° F. and 30 to 40 psi for nine months. No failure, no shutdown, no replacement.
4. Chromyl chloride at ambient temperature and 15 psi. Diaphragm condition good at end of thirty days' test.
5. Liquid chloral saturated with HCl at 158° F. for 408 hours. Well satisfied — have placed orders for additional diaphragms.

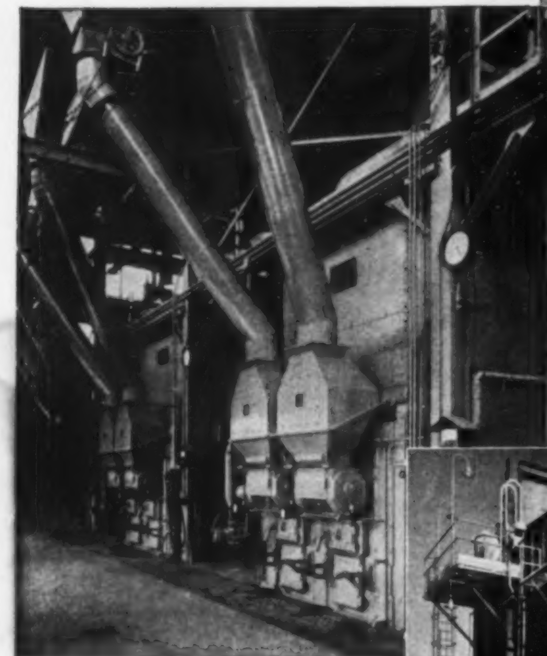
"KEL-F" is the registered trade name for polytrifluorochlorethylene, an exceptionally stable thermoplastic. It is produced by the M. W. Kellogg Co.

GRINNELL

WHENEVER PIPING IS INVOLVED

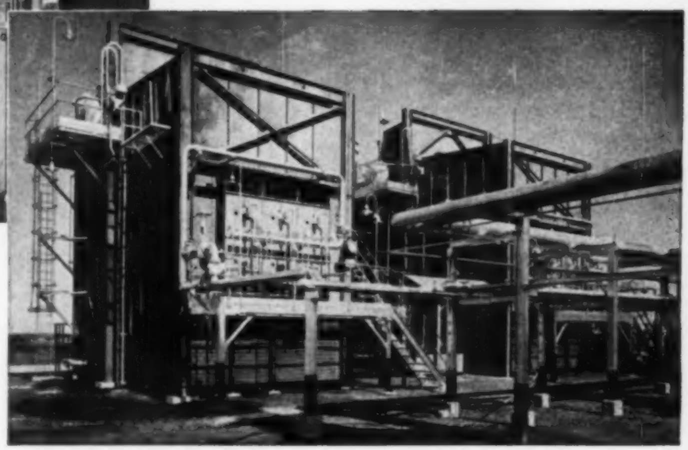
GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane





Planning

Installation for medium and smaller plants . . . pressure to 475 psi . . . capacity to 60,000 lbs. of steam per hr . . . suitable for any type of fuel.



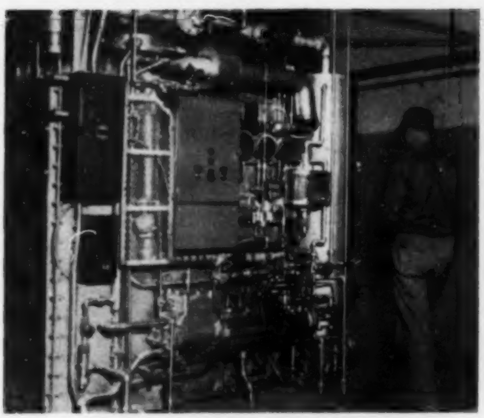
Installation for larger plants . . . pressure to 1000 psi . . . temperature to 900 F . . . capacity to 350,000 lbs. per hr . . . any fuel or type of firing . . . indoor or outdoor type construction.

COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY

Installation for small plants . . . pressure up to 150 psi . . . capacity to 12,000 lbs. of steam per hr . . . adaptable to any fuel.

? to buy BOILERS ...this year



Installation for special conditions including very limited space . . . quick steaming (full capacity in 3 min.) . . . fully automatic operation . . . capacity to 6000 lbs. of steam per hr . . . pressure to 300 psi. Ideal for intermittent load.

Sometime this year, or perhaps next, your company may decide to buy new boilers . . . to replace obsolete units . . . to meet increasing steam demands . . . or for a new plant. Whatever the time or circumstances, here's something it will pay you to remember. With fuel and operating costs firmly established at new high levels, today more than ever before, the first cost of a new boiler is decidedly secondary to the annual operating cost. In fact, the annual cost of fuel alone for the average boiler installation nowadays usually equals or exceeds the purchase price. And the normal life of a boiler should be 20 to 30 years, or longer.

Obviously, then, the operating economies accruing from better design, construction or application, will quickly offset the difference between the cheapest boiler you can buy and the best the market affords. Here is one case where the old adage "the best is the cheapest" really applies.

In addition to having installed thousands of industrial boilers . . . in every size category from less than 100 horsepower up . . . Combustion has designed and built many of the country's largest utility power station boilers. And it is in this field — the manufacturing of power on a large scale — that boiler design and construction are evaluated most critically and exhaustively.

The fact that C-E Boilers have been selected to meet the exacting performance standards of so many of the nation's largest utility power stations is evidence of the quality of design and construction you can expect to find in any boiler, large or small, that bears the Combustion nameplate.

Our recommendations as to the most suitable type of boiler and firing equipment for the *specific requirements* of your next installation are available to you and your consultants without obligation.

B-383A

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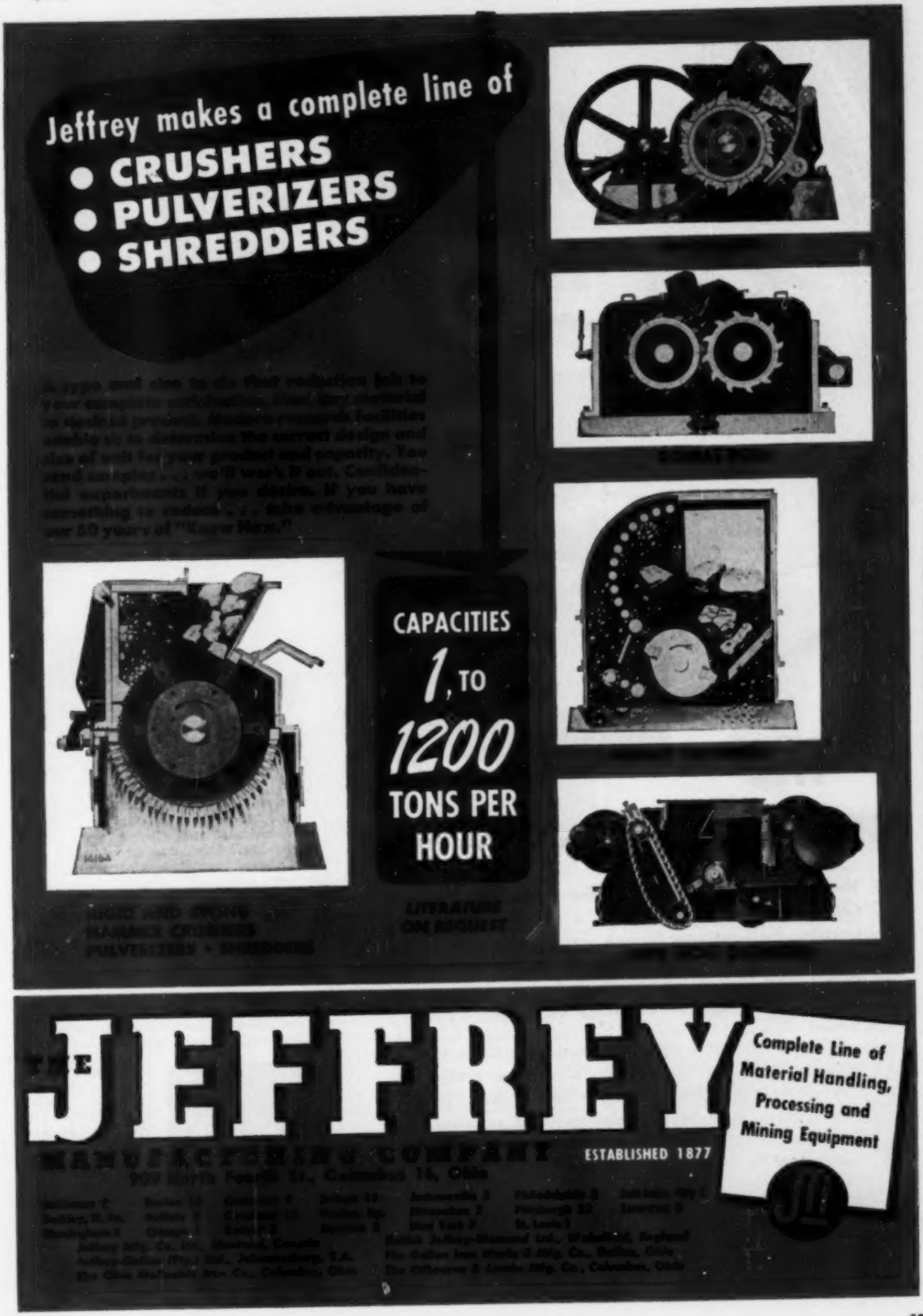
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Complete Line of Material Handling, Processing and Mining Equipment

"TAG" Pneumatic Controllers Govern Temperature, Pressure

Pressure, vacuum or temperature can be accurately regulated by the Pneumatic Controllers engineered by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. These trustworthy devices maintain the conditions for which they are set by varying air pressure in a control line, which in turn operates a diaphragm valve to increase or decrease the flow of fluid (air, gas, steam, liquid) to the equipment being controlled.

Operating on an air supply of 18 p.s.i. pressure, TAG controllers handle temperatures between −100°F. and 1000°F., or pressures between 30" vacuum and 7500 p.s.i.

Dielectric Moisture Meter Checks Various Materials

Moisture content of finely powdered, relatively dry, or coarse and oily materials is determined in less than two minutes with the versatile Model 8007 Dielectric Moisture Meter developed by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. Operating over an extremely wide range, this meter functions without damaging the sample.

To use, a weighed sample is placed in a cell inserted in the instrument. The meter shows the material's capacitance, which simple tables convert into percent moisture. Chemicals, dehydrated foods, soaps, flours, seeds, plastic molding powders, iron ore, coal, cheese, coffee, corn, grain, dried leaf, flue dust, starch, yeast and cottonseed typify materials tested.

"TAG" Saturation Controller Regulates Relative Humidity

An instrument which records and automatically controls humidity has been developed by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. Utilizing the psychrometric wet-and-dry bulb principle, the controller automatically regulates the wet-bulb depression (relative humidity) for which it is set, regardless of fluctuations in dry-bulb temperature.

Two pens operate on a circular 10-inch chart, simultaneously recording the dry-bulb temperature and the wet-bulb depression. Flow of humidifying agent (moisture, steam or oil fog) is regulated by a valve operated by the instrument.

Stainless requires careful selection, too!

Before you marry your product to stainless steel, make certain that you've chosen the right analysis. *Stainless* is a broad term applied to a whole host of steels, each with its own characteristics. And to get the most out of stainless you must select with care.

That's why Crucible, a pioneer in the development of this specialty, offers you the services of a staff of metallurgists, well qualified by experience with hundreds of applications, to help you put stainless to work properly.

For more than half a century, Crucible has been the leader in the specialty steel field. There is no substitute for Crucible background — take full advantage of it. When you think of stainless — call in Crucible. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

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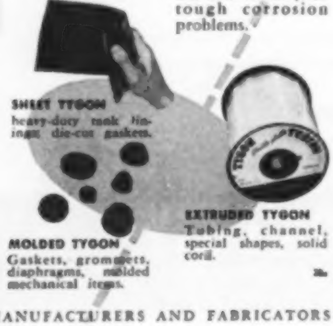
STOPS CORROSION

It's worth checking into — one of the many Tygon Plastic formulations may be the answer to your tough corrosion problems.



Tygon Paint is a liquid formulation of the versatile Tygon series of corrosion-resistant plastics. It is applied with spray gun or brush. Tygon Paint air-dries to form a tough, tight-adhering plastic "skin" over metal or concrete . . . sets up a sturdy, impermeable barrier against corrosion.

Liquid Tygon is not an ordinary paint. If an ordinary paint will do the job — use it. Use liquid Tygon where ordinary coatings fail. Selectively used it can cut repainting costs as much as one half — will add immeasurably to the maintenance-free life of metal or concrete surfaces exposed to corrosive atmospheres, spillage, acid condensates.

Write today for Bulletin 712. Tells how and where Tygon Paint can cut your corrosive maintenance costs. Address The U. S. Stoneware Co., Tallmadge Square, Akron 9, Ohio.

MANUFACTURERS AND FABRICATORS OF CORROSION RESISTANT MATERIALS AND EQUIPMENT SINCE 1865

THE *Chementator*

Reg. U. S. Pat. Off.

Titanium pigment shortage

Pigment industry executives and National Production Authority officials delved into the shortage of titanium pigments at a recent Washington meeting. They're badly needed now for the manufacture of paints, printing inks, rubber, plastics and other products.

NPA says titanium pigments are in short supply because of reduced deliveries of sulphuric acid, which is used in making them.

Wanted: more benzene from petroleum

NEW FACILITIES—Chemical executives have asked the government to authorize facilities for the production of 88 million gallons a year of synthetic benzene from petroleum to meet defense needs. They propose a goal of 280 million gallons of benzene for 1953, or about 300 million gallons if imports from Western Europe continue at the present rate of about 20 million gallons a year.

QUICK WRITEOFFS—Applications for certificates of necessity for the construction of petroleum benzene facilities have already been received; enough such projects have been proposed to bring in well over half the goal of 88 million gallons. That's what Carroll Fentress and T. L. Apjohn of the Petroleum Administration for Defense told the chemical executives at the Washington meeting.

SOURCES—Petroleum currently is producing about 12 million gallons of benzene a year and coal about 165 million gallons. Production of benzene from coal is expected to reach about 180 million gallons by 1953 as a result of the construction of new coke ovens for the steel expansion program.

ALL-OUT EFFORT—Chemical spokesmen also urged the government to do everything possible to keep benzene production at maximum capacity and to increase output from present sources. Attention was directed to shortages of sulphuric acid and building materials. Sulphuric acid is used in one of the processes involved in recovering benzene from the light oil that is a byproduct of the production of coke and coke gas from coal.

COKE OVENS—A survey is now under way, reported George Wilson of the Defense Solid Fuels Administration, to determine the possibilities of increasing benzene recovery from coke ovens. Old ovens are being retired almost as fast as new ones are built, but the new ovens have greater capacity than the old ones.

STATISTICS—A task group estimates the demand for benzene at 252 million gallons in 1951, 307 million gallons in 1952, and 338 million gallons in 1953 to meet the needs of the mobilization program and the civilian economy. Consumption in 1950 is estimated at 188 million gallons. Supplies in 1951 are expected to total slightly more than 200 million gallons.

TRENDS—Large users of benzene estimate that supplies for civilian uses will grow somewhat tighter during 1951, ease and perhaps equal present supply in 1952, and rise above the present level in 1953 if the mobilization program follows the expected pattern and if production goals are met.

A large part of the benzene supply is being diverted from normal uses to the production of synthetic rubber.

Benzene demand would be expected to reach 262 million gallons a year by 1953 and 315 million gallons by 1955 if there were no mobilization program, so rapidly have its uses mushroomed.

USES—Major uses of benzene include the manufacture of synthetic phenol for use in plastics, styrene for making rubber and plastics, aniline, nylon, DDT, detergents, and many chemical products.

BRAIN TRUST—Executives from Allied, American Cyanamid, Atlantic Refining, Dow, Du Pont, Esso, Koppers, Monsanto, Montrose Chemical, Oronite, Pan American Refining, Pittsburgh Coke & Chemical, Republic Steel, Shell Chemical, U. S. Rubber, Union Carbide took part in the Washington conference. Schlueter of NPA's Chemical Division presided.

Coal chemicals: more as big steel girds

More coal chemicals will become available as the mammoth American steel industry expands to meet national defense needs. At a cost of over $400 million, the United States Steel Corp. will build on the banks of the Delaware River near Morrisville, Pa., a wholly integrated steel plant capable of turning out 1.8 million tons of steel ingots a year. Slated for completion by the end of 1952, this new Fairless Works is believed to be the largest single expansion project ever undertaken by an American steel company.

It will include a coke and coal chemical plant, with two 85-ton byproduct coke batteries having an annual capacity of 916,000 tons of coke. From this plant will come tonnages of such important coal chemicals as light oils, ammonium sulphate, crude naphthalene and

(Continued on page 72)

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

tar. Defense requirements for these products exist throughout New England and in the industrial areas of New York, New Jersey and eastern Pennsylvania.

Dissolution of Farben

Attempts are still being made to lop tentacles off the I. G. Farben octopus. West German officials have agreed in principle to a breakup of most of I. G. Farben into nine independent companies. The rest of the Farben holdings will be sold or reformed into additional independent companies, they say.

Negotiations are still going on between representatives of the Allied High Commission and the Bonn government over details of Farben's dissolution.

Dow offers to explore nuclear power

Wider industrial participation in the reactor development phases of the national atomic energy program is being urged on AEC.

Dr. M. E. Putnam, general manager of Dow, states that his company has asked the AEC to allow a joint study with Detroit Edison to learn whether nuclear energy can be used advantageously to make electric power for industry.

Dow Chemical and other industrial companies, he says, agree that atomic energy should be explored and, if possible, utilized to provide increased productivity for all mankind. Putnam declares that his company offers AEC its technical knowledge, research facilities and resources for a study to find power that will bolster our defense production at this time and provide industry with new productivity in peacetime.

"It is most encouraging," Dr. Putnam adds, "when any governmental agency displays the willingness to utilize the resources of and work cooperatively with the American industrial team."

Wulff process: acetylene from natural gas

THERMAL CRACKING—First commercial plant for making acetylene by an improved Wulff process, which employs the thermal cracking of natural gas, is ready to go into production in Los Angeles, where Wulff Process Co. has built the $100,000 unit. It's designed to produce a million cubic feet of acetylene per month. That's about the size of a typical acetylene-from-carbide plant in the Los Angeles area.

DESIGN—Incorporating a number of improvements made in recent years, the plant was designed by R. L. Hasche of Tennessee Eastman. The design is based on experimental work begun in 1926 at Los Angeles by Robert G. Wulff under the direction of C. J. Coberly, president of Wulff Process Co. Wulff is no longer active in the firm. However, both he and Hasche are stockholders in Wulff Process Co. The company owns and has licenses under a number of patents, and has licensed the process to Tennessee Eastman, which has done considerable pilot-plant work with it, and will license it to others.

COSTS—Although company officials won't offer firm estimates of costs until the plant has been running for a while, they declare that the figure will run well under 9 c. a lb. One major cost item in the relatively small Los Angeles unit will be operating labor, two men working on each shift. The plant is highly flexible, so operating data can be obtained for a variety of conditions.

Zirconia: key to high-temperature reactions

A new era in chemical processing at high reaction temperatures may be heralded by the advent of an important refractory—stabilized fused zirconia. Norton Co. will quadruple its 1950 output this year, and production in 1950 was itself six times that of 1949. Major present use is as kiln furniture for the firing of barium titanate insulators.

But stabilized fused zirconia has far-reaching possibilities in other applications that Norton isn't overlooking. Direct synthesis of nitric acid and the cracking of gases are but two of these. Most significant is that the top working temperature of zirconia is 4,700 deg. F. (see p. 199).

Everything's bigger in Texas

Dow has let contracts for a $70 million expansion at Freeport, Tex. This comes on top of the $30 million expansion Dow already has under way at Freeport. Work has started on the new construction program.

One contract, with United Gas, calls for a 20-in. line to bring natural gas from Needville, 55 miles north of Freeport. A 20-in. pipeline would deliver about 150 million cubic feet per day. Heretofore, a plant consuming 50 million cubic feet a day was considered a whopper. In addition to this tremendous new natural gas supply from United Gas, Dow's own subsidiary near Freeport will probably step up gas production to the maximum.

Another contract, for $10 million, went to Stone & Webster. Four power plants, two at Freeport and two at Velasco, are also part of Dow's big Texas project.

More cold rubber capacity

More of the government's GR-S plants are being equipped for production of cold rubber. The Port Neches, Tex., synthetic plant, operated by B. F. Goodrich Chemical, will install refrigeration equipment to expand its output of cold rubber from one-half to three-quarters of its 60,000-ton capacity.

Simultaneously, U. S. Rubber reveals plans for expansion of cold rubber capacity at the plant it runs for the government at Port Neches. To cost over $1 million, this expansion will convert 40 percent of the plant's facilities to cold rubber and increase capacity for production of standard synthetic rubber from 60,000 to

(Continued on page 76)

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Columbia is a dependable name in chemicals. Its efforts are never ending to explore new uses for its products, to improve present uses, and to effect economies wherever possible in manufacture and delivery for the benefit of everyone. Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pennsylvania.

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Control cubicle for rectifier and protective equipment.

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Twin rectifier units (right) and control cubicle (left). Note clean appearance and absence of complicated external auxiliaries.

Get the complete story: You'll find complete technical information, including a detailed presentation of operating principles, in I-T-E's Bulletin 4809. Send for it today. The I-T-E representative in your locality will be glad to advise you on adapting the Mechanical Rectifier to your specific needs. Consult him without obligation.

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91,000 tons yearly. This reactivated plant reached full production January 1, and is producing at the rate of 72,000 tons of rubber a year.

Chemicals from natural gas

National Research Corp. is initiating a long-range research program directed toward the production of strategic chemicals and chemical products from natural gas. Teaming up with National Research on this project are United Gas Corp. and Electric Bond & Share Co.

United Gas operates one of the country's foremost natural gas systems and controls large volumes of natural gas reserves. Electric Bond & Share and its subsidiary, Ebasco Services, have long been identified with operations in the natural gas industry. And National Research has experience in the development of new industrial processes.

Solvay boosting soda ash capacity

Allied's Solvay Process Division plans new alkali capacity at two locations. At Syracuse, N. Y., it will build a $2.5 million plant to double ammonium bicarbonate capacity. And at Baton Rouge, La., it will expand its soda ash production by 200,000 net tons a year if it gets the required certificate of necessity from the government. It will take about two years to build this plant.

Industrial mobilization is taking more and more soda ash. It's needed in the manufacture of aluminum, catalyst for aviation gasoline, glass, cleansers and chemicals. Refining of tin, cobalt, uranium, nickel, iron and other strategic metals calls for plenty of soda ash.

From Sabine, twice as much polythene

Polythene production will be doubled at the Sabine River plant of Du Pont at Orange, Tex. Construction will start immediately on the multi-million dollar project. At least some units will probably get into production late this year, the remaining units will be completed late in 1952.

While the Sabine River works was originally built to turn out nylon salt for shipment to other Du Pont plants to be converted into fiber, other chemicals have since been added to the list of products. Hence the Orange plant has been expanding almost constantly.

Silver Bow: new source of phosphorus

An easing of the phosphoric acid shortage is promised. The $5 million elemental phosphorus plant of Victor Chemical at Silver Bow, Mont., is about half completed and should be producing phosphorus for war and peacetime uses by September. Raw material for the plant is a low-grade phosphate rock from the Maiden Rock deposit of Montana, about 25 miles southwest of Butte.

The ore runs about 27 percent phosphate, not high enough for making economically superphosphate for fertilizers. However, at Silver Bow it will be converted in a mammoth electric furnace into elemental phosphorus, and then at Victor's other plants eventually into such other compounds as phosphoric acid.

Hydroelectric power for the furnace will be brought over the Rockies from Bonneville Dam on the Columbia River. Some power will be obtained from the Montana Power Co.

A large amount of the phosphorus will be shipped to United States arsenals for the manufacture of tracer bullets, incendiary bombs, anti-personnel mortar shells, phosphorus grenades and screening smokes.

Largest use for phosphorus itself is in making matches. Quantities are used, however, in medicines, rat poisons, phosphorus compounds and in metallic alloys. Among industries using phosphorus and its compounds are the plastics, pharmaceutical, soap, detergent, food, leather tanning and textile industries.

Manufacture of superphosphate for fertilizer is a big business in the United States, and growing larger each year. Annual production of phosphate rock from mines in the U. S. is close to 10 million tons. Treating the insoluble rock with sulphuric acid produces the soluble superphosphate. Approximately one-third of the sulphuric acid made in the United States is used in the fertilizer industry.

Chemicals pay off for packer

Chemicals, pharmaceuticals, soaps, abrasives and other non-food items accounted for 58 percent of the 1950 dollars earned by Armour & Co., second largest packing company in the nation. Meat, poultry and other food items earned the remaining 42 percent. The fast growing chemical process industries have many ramifications, and it's significant to find that more than half of a packer's dollars are chemically earned.

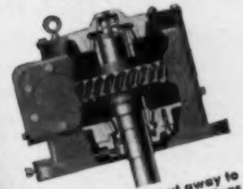
Acthar (Armour's ACTH) earned a big chunk of the pharmaceutical dollars in 1950, bolstered by increased production, a 50 percent reduction in cost, and new medical uses. Tryptar, which is crystalline trypsin, seems destined to do likewise in 1951.

U. S. cobalt production expands

Howe Sound Co., which is setting up cobalt ore concentration equipment near its Blackbird mine in Idaho and a refinery at Garfield, Utah, is planning virtually to double its announced production before completion of its initial facilities. The Calera Mining Co., which is to operate the Blackbird facilities, is currently installing a 600-ton mill scheduled for operation by midsummer.

The Calera subsidiary, however, contemplates increasing the daily capacity of the cobalt ore concentration equipment to 1,000 tons. "Certain government guarantees" are being sought to insure this

(*Continued on page* 78)



Above—ND unit, cut away to show tapered roller bearings on gear shaft, positive face-type oil seal, unique lubricating pump and oil drain at base of housing.

Left—1,000-gallon mixing kettle built by the Water Tube Boiler & Tank Co. for the Pyroxylin Products Co., Chicago, for use in mixing viscous lacquers.

Low overhead clearance with ND mixer drive

An outstanding advantage of Cleveland's new ND vertical worm gear speed reducer is its low height. Installed on this 1,000 gallon mixing kettle, the ND unit adds only 16 inches to over-all height—no more than that of the motor.

The ND reducer and its companion NU unit (with drive shaft upward) are available in seven sizes each. Because of their several unique construction features, they will give efficient, trouble-free service on such equipment as agitators, mixers, overhead chain conveyors, etc., wherever vertical drives without outboard bearings are desirable.

For complete description, capacity charts and other engineering data on types ND and NU, write for our Bulletin 125. The Cleveland Worm & Gear Company, 3273 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited

CLEVELAND
Worm Gear
Speed Reducers

production boost, but no details are revealed and no date for a government decision can be predicted, according to H. H. Sharp, president of Howe.

If the 1,000 ton per day output is assured in Idaho, there's reason to believe the $1.4 million cobalt refinery at Garfield, slated to produce 2 million pounds of refined cobalt annually by 1952, will likewise be expanded to meet the government's stepped-up demand for the critical metal.

In Texas, good neighbors

Here's a neat little nexus of inter-company expansion on the Gulf Coast:

At a cost of $2 million, Diamond Alkali will increase the chlorine-caustic output of its Deer Park, Tex., plant by about 50 percent. Much of the added chlorine output will go to the neighboring plant of Shell Chemical.

Shell is enlarging its ethyl chloride, glycerine and ethylene production units. Much of Shell's extra ethylene is likely to be piped next door to the plant of Ethyl Corp. Sinclair Refining, on the other side of Ethyl Corp., is also said to have a contract to supply ethylene to Ethyl. Shell's ethyl chloride goes to Hercules and others.

Smart quarterbacking by Mathieson

Mathieson is considering changing from ammonium sulphate production to ammonium nitrate at its Pasadena, Tex., plant due to the sulphur shortage.

Sulphuric acid made at the plant could be more economically used for making ammonium phosphate, superphosphate and triple superphosphate.

Nitric acid for the proposed operation at Pasadena would come from Mathieson's Lake Charles, La., plant.

Incidentally, it's rumored that Mathieson at Lake Charles may be pulling out of the soda ash business, planning instead to convert its entire output of ash there to caustic soda. Of course, the Lake Charles plant has always converted some soda ash to caustic.

For the Midwest, more formaldehyde

Spencer Chemical's formaldehyde plant at Calumet City, Ill., is currently producing 50 tons per day. Methanol, the raw material, comes by tank car from the Kansas works of Spencer.

Much of the formaldehyde goes (almost entirely by tank truck) to Midwest resin manufacturers. But some is delivered by pipeline to the neighboring plants of Celanese and Catalin. In fact, Catalin located next to Spencer to save on freight: it brings in 100 percent phenol instead of formaldehyde, which is 63 percent water. A phone call to Spencer next door, and Catalin gets its formaldehyde via pipeline.

Most of the formaldehyde Spencer makes is the familiar 37 percent solution, but the process can be varied to give other concentrations. The plant could produce paraformaldehyde by the Celanese powder flake process if demand arose.

In wartime, Spencer could ship formaldehyde from Calumet City and anhydrous ammonia from its West Henderson, Ky., works to its Charlestown, Ind., plant to make hexamine and consequently RDX. This powerful explosive is cyclotrimethylene trinitramine; it's made by reacting hexamine with concentrated nitric acid. More devastating than TNT, with at least 50 percent more power, it's being used now in bazookas in Korea.

West Coast whooshes into rocket fuels

Construction of a $2 million plant at Vancouver, Wash., for the manufacture of hydrogen peroxide is expected to be started this month by Buffalo Electro-Chemical. The plant should be completed by early 1952. Initial power rating is expected to be 1,800 kw., rising to 3,500 kw. after the first year of operation.

Hydrogen peroxide is used for bleaching wood pulp and also as a propellant for rockets.

Elsewhere, a $6 million plant for the manufacture of solid propellants for missiles will be built at Sacramento, Calif., by Aerojet Engineering Corp. The company will continue to produce liquid fuels for guided missiles at Azusa, Calif. The new Sacramento plant is expected to start up by the middle of this year.

Will McCarthy sell his chemical plant?

Is someone going to purchase the $8 million methanol-formaldehyde-acetaldehyde plant of oil man Glenn H. McCarthy at Winnie, Tex.? Both Du Pont and Celanese disclaim any such intention. It's rumored that American-Marietta might be interested. But the most likely purchaser at the moment seems to be Spencer Chemical.

Spencer's preferred stock is now on the New York Stock Exchange; Spencer chose this as the cheapest way to raise the $8.5 million it needed. Did it need this money to pay for recently purchased plants at West Henderson, Ky., and Charlestown, Ind., or is it also getting a little kitty together to bid on McCarthy's plant?

Should the government approve a five-year write-off, look for some chemical company, probably Spencer, to plunk down the $8 million McCarthy's asking. Shut down since February a year ago, the Winnie plant has been kept in standby condition. Even so, it might cost as much as $6 million to get it back into operation again.

Air Reduction sells USI stock

Air Reduction has sold for cash its entire holdings of stock of United States Industrial Chemicals, totaling 122,907 shares. The purchaser: National Distillers Products Corp. *—End*

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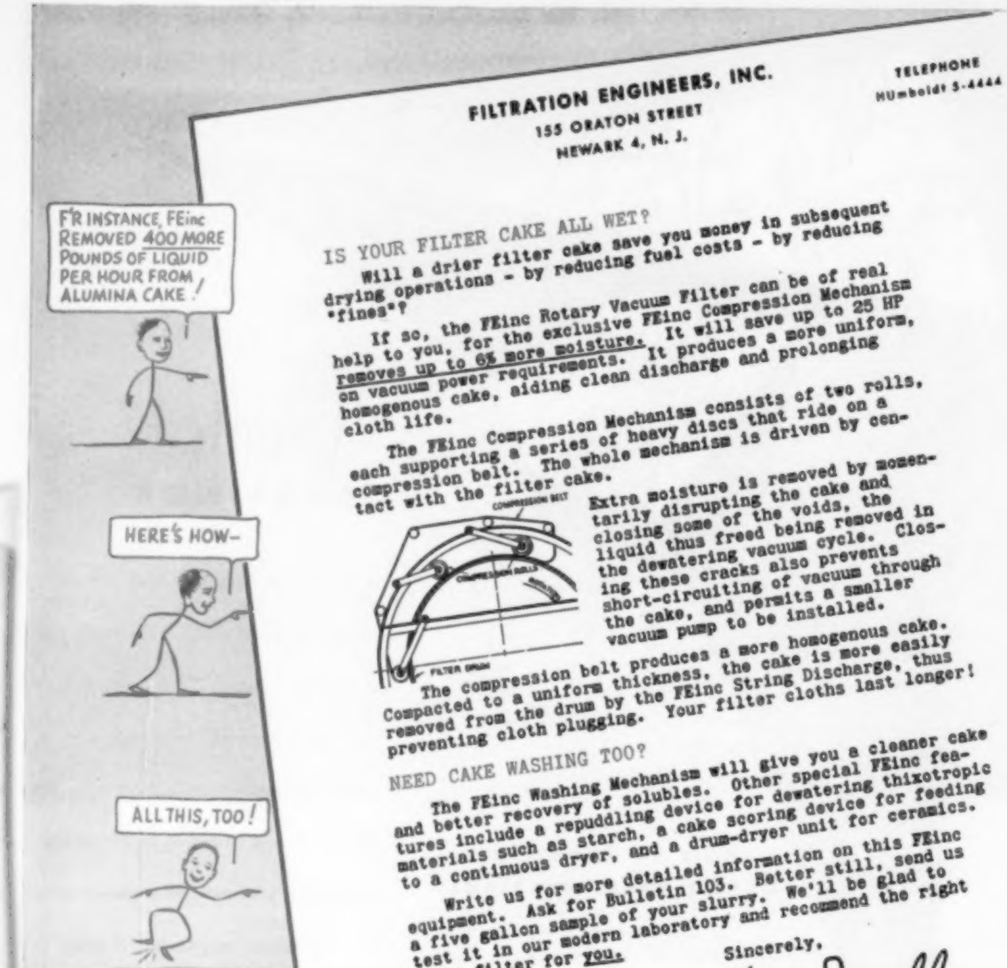
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FILTER DRUM
Extra moisture is removed by momentarily disrupting the cake and closing some of the voids, the liquid thus freed being removed in the dewatering vacuum cycle. Closing these cracks also prevents short-circuiting of vacuum through the cake, and permits a smaller vacuum pump to be installed.
The compression belt produces a more homogenous cake. Compacted to a uniform thickness, the cake is more easily removed from the drum by the FEinc String Discharge, thus preventing cloth plugging. Your filter cloths last longer!
NEED CAKE WASHING TOO?
The FEinc Washing Mechanism will give you a cleaner cake and better recovery of solubles. Other special FEinc features include a repuddling device for dewatering thixotropic materials such as starch, a cake scoring device for feeding to a continuous dryer, and a drum-dryer unit for ceramics.
Write us for more detailed information on this FEinc equipment. Ask for Bulletin 103. Better still, send us a five gallon sample of your slurry. We'll be glad to test it in our modern laboratory and recommend the right FEinc filter for you.
Sincerely,
H. M. Small
FILTRATION ENGINEERS, INC.
FE
• PATENTED STRING DISCHARGE FILTERS •
CONTINUOUS ROTARY VACUUM FILTERS
FOR CHEMICALS, FOOD, PHARMACEUTICALS,
METALLURGY, CERAMICS AND SEWAGE

"We will <u>sign</u> it with our name"

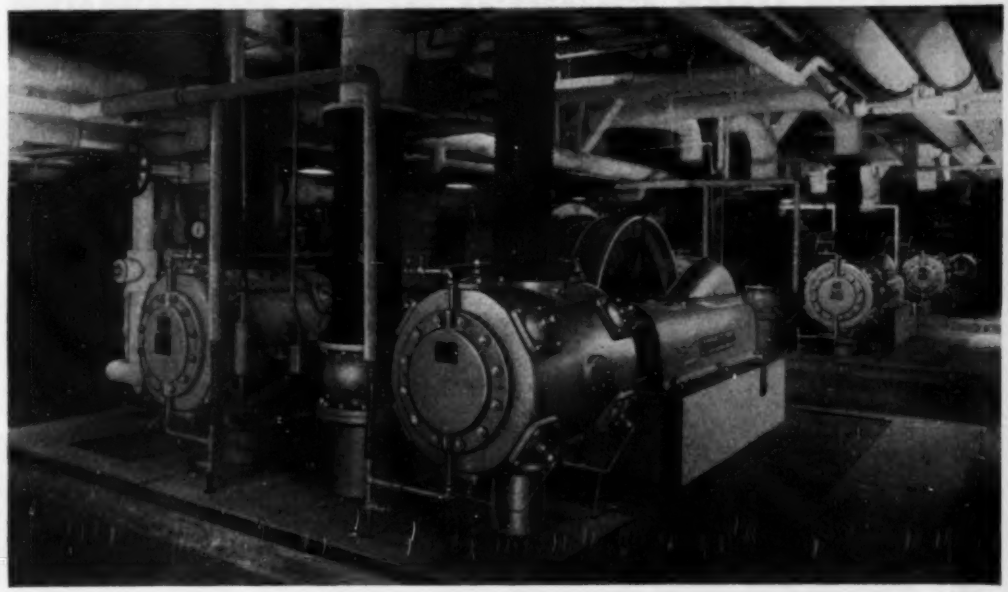
Few things in life are as precious to a man as his name. He bestows it with pride on his heirs. He does not sign it lightly. To the man of integrity, his signature is not so much a means of identification as an evidence of good faith.

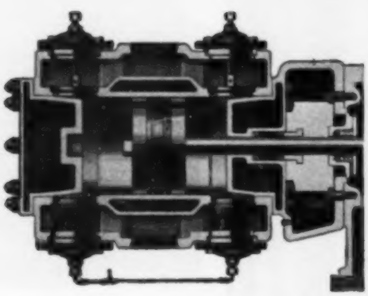
When the Jenkins brothers were satisfied they had made the best valve money could buy, they *signed* it with their name. Today, as for over three quarters of a century, that signature — forming, with the famous Diamond, the Jenkins trade mark — is more than a symbol of the maker's pride in his craftsmanship. It is the mark of a friend you can trust.

Jenkins Bros., 100 Park Avenue, New York 17. Jenkins Bros., Ltd., Montreal.

JENKINS VALVES

PRODUCTION OF CHLOROMYCETIN DEMANDS STERILE AIR





Advantages of Ingersoll-Rand "NL" Cylinders

The Ingersoll-Rand "NL" cylinder achieves oil-free compression without the use of tail rods or secondary crossheads. The weight of the piston is supported by graphitic-carbon wearing rings which prevent metallic contact between the piston and the honed cylinder bore. Compression rings are also carbon... metallic inner expanding rings giving the proper wall pressure. Because the carbon rings are self-lubricating, the need for any conventional lubricant is completely eliminated. Wearing rings can be adjusted to maintain the proper clearances.

Four Ingersoll-Rand "NL" Compressors Supply Air for Mold Growth in Parke, Davis & Co. Plant

In its Detroit plant, Parke, Davis & Co. is producing Chloromycetin by both biological and synthetic processes. The biological method includes an air-activated fermentation process that must be free from any contamination.

Air for activating the mold growth is compressed to about 40 psig by four Ingersoll-Rand XRE electric-driven compressors. Since any oil or other lubricant used in the compressor cylinders would contaminate this air, the compressors are fitted with Ingersoll-Rand "NL" *non-lubricated* cylinders. Other precautions to assure sterile, contamination-free air to the fermentation tanks include electrostatic filters on the compressor intake, moisture-removing aftercoolers, and stainless-steel mesh and carbon sterilizing filters.

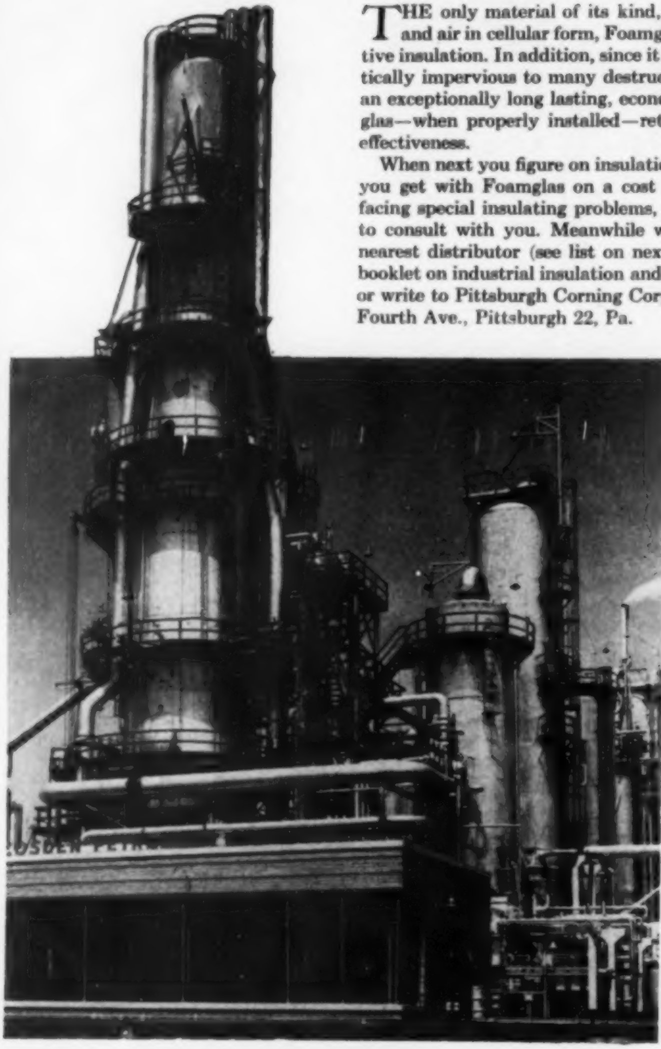
For such services demanding oil-free air or gas, Ingersoll-Rand builds standard lines of compressors fitted with "NL" *non-lubricated* cylinders. Sizes range up to 300 hp for handling air or any gas up to a discharge pressure of 2500 psi. Consult Ingersoll-Rand engineers on how you can use "NL" compressors for your process or instrument-control.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.   387-1

THE BEST GLASS INSULATION IS CELLULAR GLASS...

the only cellular glass insulation



THE only material of its kind, composed entirely of glass and air in cellular form, Foamglas is an exceptionally effective insulation. In addition, since it is glass, and therefore practically impervious to many destructive elements, Foamglas is an exceptionally long lasting, economical material. PC Foamglas—when properly installed—retains its *original* insulating effectiveness.

When next you figure on insulation, consider the advantages you get with Foamglas on a cost per year basis. If you are facing special insulating problems, our specialists will be glad to consult with you. Meanwhile why not write or call your nearest distributor (see list on next page) for our descriptive booklet on industrial insulation and a sample of PC Foamglas, or write to Pittsburgh Corning Corporation, Dept. CC-21, 307 Fourth Ave., Pittsburgh 22, Pa.

The towers of this new refinery are insulated with PC Foamglas, finished with corrugated aluminum. Foamglas comes in standard flat blocks, curved segments and beveled lags to fit many types of equipment. Insulation Contractor: The Aber Company, Inc., Houston, Texas.

® PITTSBURGH PC CORNING

FOAMGLAS cellular

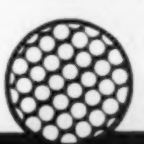
... WHEN YOU INSULATE WITH FOAMGLAS ... THE INSULATION LASTS!

is PC Foamglas

Preformed sections of PC Foamglas are available for standard pipe sizes and fittings. Installation is quick and easy. Photo courtesy of North Brothers, Atlanta, Ga.

PC Foamglas, on sides and head of this evaporator will help maintain the 280° to 320°F. temperatures required for drying "green" wood prior to creosoting. Photo courtesy of Taylor-Colquitt Company, Spartansburg, S. C.

THIS DIAGRAM SHOWS how a group of glass bubbles which contains still air, can form a continuous, cellular material. The black area is glass, the white space is air. PC Foamglas, the cellular glass insulating material, consists of glass and still air, both excellent barriers to heat travel. And, being glass, Foamglas has unusually high resistance to moisture, vapor, fumes and acid atmospheres, is noncombustible, odorless and verminproof. In this cellular glass construction lies the secret of the long lasting insulation value of PC Foamglas.



These prominent concerns distribute and install
PC FOAMGLAS INDUSTRIAL INSULATION
Write for descriptive literature

ALABAMA
Redhom Insulation Company, Inc.
1909 First Avenue, South
Birmingham 3, Alabama

Insulation Engineers, Inc.
Conception St. Road & Kraft Highway
Mobile, Alabama

CALIFORNIA
Plant Asbestos Company
5309 Horton Street
Emeryville 8, California

Plant Insulation Company
2120 East 25th Street
Los Angeles 58, California

Plant Insulation Company
101 Marine Avenue
Wilmington, California

CONNECTICUT
The Insulation Company
624 Oakwood Avenue
West Hartford, Connecticut

DISTRICT OF COLUMBIA
The Standard Insulation Co.
of Maryland, Inc.
1828 Columbia Road, N. W.
Washington 9, D. C.

FLORIDA
P. Richardson
311 Mendoza Avenue
Coral Gables 34, Florida

Asbestos Insulation Company
119 West 7th Avenue
P. O. Box 548
Tampa, Florida

GEORGIA
North Brothers
911 Boulevard, N. E.
Atlanta 1, Georgia

North Brothers
644 West Bay Street
Savannah, Georgia

ILLINOIS
Standard Asbestos Mfg. Company
860 W. Evergreen Avenue
Chicago 22, Illinois

INDIANA
M. H. Hilt, Inc.
2531 North Clinton Street
Fort Wayne 3, Indiana

Chas. W. Kengle Company
718 North Senate Street
Indianapolis 2, Indiana

IOWA
R. M. Daly & Company
520-22 W. Elm Street
Des Moines 9, Iowa

KENTUCKY
General Insulation & Roofing Co., Inc.
301 West Main Street
Louisville 2, Kentucky

LOUISIANA
The Aber Company, Inc.
1800 Old Benton Road
Shreveport, Louisiana

MARYLAND
The Standard Insulation Company
of Maryland, Inc.
1117 Low Street
Baltimore 2, Maryland

MASSACHUSETTS
Cork Engineering & Insulation Co., Inc.
57 Braintree Street, Allston
Boston, Massachusetts

MICHIGAN
Michcork Company
730 Dix Avenue, South
Detroit 25, Michigan

Tony Rotenberg Insulation Company
914 Roger Street, N. W.
Grand Rapids 4, Michigan

MINNESOTA
Asbestos Products, Inc.
710 Raymond Avenue
St. Paul 4, Minnesota

MISSOURI
Kelley Asbestos Products Company
2830 Grand Avenue
Kansas City 8, Missouri

NEBRASKA
Kelley Asbestos Products Company
1205 Farnam Street
Omaha, Nebraska

NEW JERSEY
Chas. S. Wood & Company, Inc.
27-31 Lombardy Place
Newark, 2, New Jersey

NEW YORK
Frontier Insulation & Asbestos, Inc.
46-48 Leroy Avenue
Buffalo 14, New York

Loco Roofing & Asbestos Company, Inc.
421-424 East Main Street
Falconer, New York

Chas. S. Wood & Company, Inc.
18 East 41st Street
New York 17, New York

NORTH CAROLINA
Starr Davis Company, Inc.
502 Guilford Avenue
Greensboro, North Carolina

OHIO
R. E. Kramig & Company, Inc.
222 East Fourteenth Street
Cincinnati 10, Ohio

Combustion Equipment & Insulation Co.
2301 Pittsburgh Avenue
Cleveland 15, Ohio

Asbestos Service Company
100 East Rayen Avenue
Youngstown 2, Ohio

OREGON
Asbestos Supply Company of Oregon
221 S. W. Front Avenue
Portland 4, Oregon

PENNSYLVANIA
Achenbach & Butler, Inc.
1508-16 Brandywine Street
Philadelphia 30, Pennsylvania

Industrial Furnace Supplies, Inc.
281 Corliss Street
Pittsburgh 20, Pennsylvania

TENNESSEE
North Brothers
2115 Maryville Pike
Knoxville, Tennessee

The M. H. Ellis Company
166 Monroe Avenue
c/o Builders Exchange
Memphis 2, Tennessee

TEXAS
The Industrial Insulators, Inc.
713 South Main Street
Borger, Texas

B. & B. Engineering & Supply Co., Inc.
2220 South Harwood Street
Dallas, Texas

The Aber Company, Inc.
206 Jensen Drive
Houston 1, Texas

B. & B. Engineering & Supply Co., Inc.
2900 Washington Avenue
Houston 1, Texas

The Industrial Insulators, Inc.
1121 Rothwell Street
Houston 1, Texas

Thermal Products Company
853 Lockwood Drive
Houston 10, Texas

VIRGINIA
C. E. Thurston & Sons, Inc.
30-32 Commercial Place
Norfolk 10, Virginia

Virginia Insulation Company, Inc.
112 South Adams Street
Richmond 15, Virginia

WASHINGTON
Asbestos Supply Company of Seattle
5835 First Avenue South
Seattle 4, Washington

Asbestos Supply Company of Spokane
1318 N. Maple Street
Spokane 12, Washington

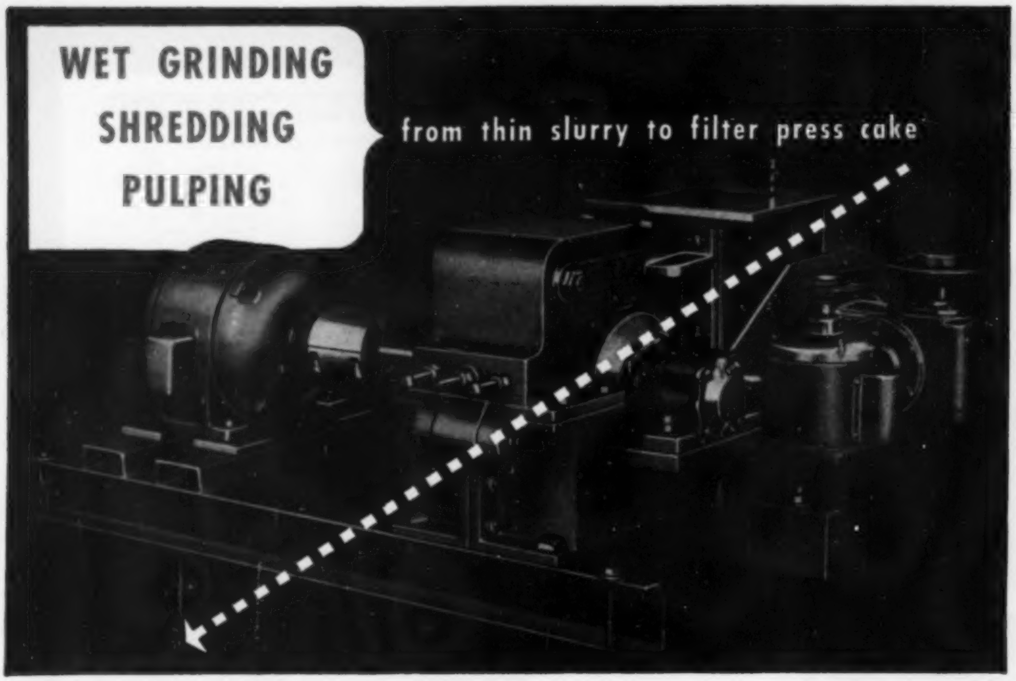
Asbestos Supply Company of Tacoma
2410 East E Street
Tacoma 2, Washington

WEST VIRGINIA
Allied Service, Inc.
Spring & Bullitt Streets, Station A
Charleston, West Virginia

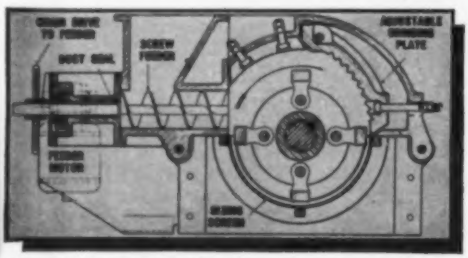
Asbestos & Insulating Company
901 Brooks Street
Charleston 21, West Virginia

WISCONSIN
Sprinkmann Sons Construction Co., Ltd.
418 North 2nd Street
Milwaukee 3, Wisconsin

glass INSULATION



WILLIAMS HELIX-SEAL HAMMERMILL



Sectional view of Helix-Seal Mill. Note long grinding plate against which the material is ground before it reaches the sizing screen. This plate is adjustable to compensate for wear.

WILLIAMS ALSO MAKES . . .

Heavy-duty hammermills; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

Williams Mills are used by many plants for the handling of wet materials . . . from thin slurry to filter press cake. When required, special construction is supplied to overcome corrosive reactions or friction hazards. Typical applications are:

- Refining wood pulp screenings when washing through mill with a large volume of water
- Flushing industrial wastes through grinder into sewage disposal system
- Shredding cellulose acetate when suspended in process liquor
- Reducing vegetables and fruits to pulp
- Shredding food-packing plant refuse preparatory to drying for stock feed
- Crushing crude ore and rock when part of a wet processing system

Specific information about individual requirements will be sent gladly upon receipt of inquiry supplying details of your grinding, crushing or disintegrating problem.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2706 N. NINTH STREET ST. LOUIS 6, MO.
WC48-16

WILLIAMS

CRUSHERS GRINDERS SHREDDERS

No other steam turbine offers you

SUCH VERSATILE STEAM NOZZLE CONTROL

The larger number of hand valves you see on a Coppus Steam Turbine promises you greater operating economy. At least 60% of the steam nozzles can be individually controlled to give maximum steam pressure in steam chest . . . a guarantee of best water rates at any load. Maintenance economy, too, is assured by the hard chromium plating of the shaft at the stuffing box. It provides the best possible smooth, non-corrosive surface for packing rings.

Coppus Steam Turbines, Type TF, driving chemical transfer pumps at Celanese Corporation of America's Chemcel Plant

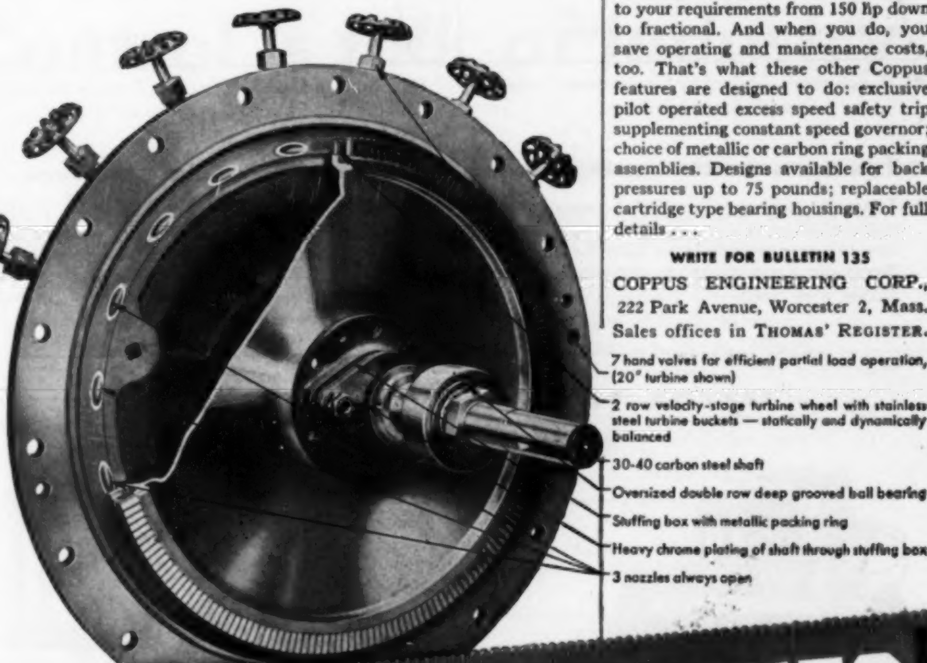
Coppus Steam Turbines ranging from 150 hp down to fractional in 6 frame sizes

MAKE TURBINE DOLLARS GO FARTHER

Why waste money buying turbines with higher horsepower ratings than you need? The higher the horsepower rating, the higher the price. Save money by selecting the Coppus Turbine size closest to your requirements from 150 hp down to fractional. And when you do, you save operating and maintenance costs, too. That's what these other Coppus features are designed to do: exclusive pilot operated excess speed safety trip supplementing constant speed governor; choice of metallic or carbon ring packing assemblies. Designs available for back pressures up to 75 pounds; replaceable cartridge type bearing housings. For full details . . .

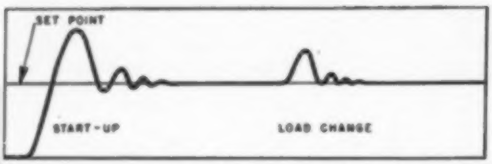
WRITE FOR BULLETIN 135

COPPUS ENGINEERING CORP., 222 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER.

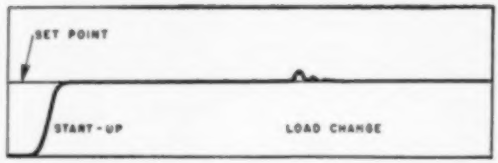


COPPUS "BLUE RIBBON" TURBINES

ORDERS POURING TAYLOR TRANSET*



(A) Process curve obtained by Conventional Controller with Automatic Reset.



(B) Result produced by Transet Tri-Act Controller under same conditions as "A".

If you want to eliminate overpeaking on start-up . . .

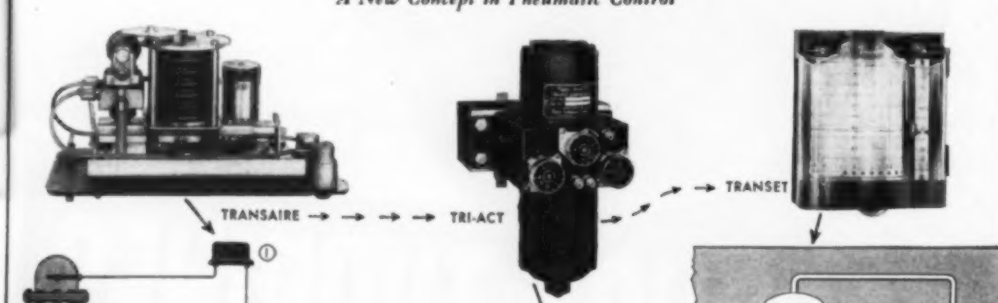
You ought to have at least one of these systems on test so that you'll know from first-hand experience how this new control circuit takes the evils out of Automatic Reset and gives the benefits of Rate Action with *stability*.

If you want to reduce the effect of load changes —

If you are engineering any new process, call in Taylor *right now*. Because with this new System you can specify the exact quality of control you want in advance. Components of the System can be put together like building blocks to meet final plant needs.

TAYLOR TRANSET CONTROL SYSTEM

A New Concept in Pneumatic Control



MONSANTO
CHEMICALS — PLASTICS

FOR YOUR INFORMATION

Every month Monsanto publishes these pages of pertinent information. Here you will find suggestions and application ideas selected to help you improve your products, lower your production costs, increase your sales. More information will be furnished on request.

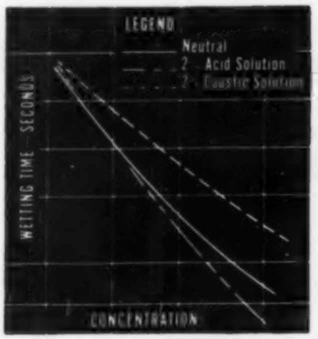
Santomerse No. 1 serves many industries in numerous ways

Monsanto Santomerse* No. 1 is called the all-purpose detergent and wetting agent because it efficiently serves so many industries in operations requiring a cleaner, a wetter, a penetrant, an emulsifier, a dispersing agent.

Santomerse No. 1 is an alkyl aryl sulfonate compound having a minimum of 40 per cent active ingredient. It is effective in acid or alkaline solutions . . . in hard or soft water . . . at all required temperatures.

In addition to its extensive use as a general-purpose cleaner, Santomerse No. 1 has an important place in many operations. For example, it has proved itself extremely valuable in the acid bath for cleaning, treating or pickling metal. It increases the rate of acid action, aids in the removal of surface oils, thereby insuring uniform action of the acid, and gives a quick and more complete drain-off of the solution and objectionable residual salts.

For more details on the use of Santomerse No. 1 in this and numerous other industries, contact the nearest Monsanto Sales Office or mail the coupon for your free copy of the 20-page booklet, "Santomerse No. 1 All-purpose wetting agent and detergent."



Comparison of Santomerse No. 1 wetting action on neutral, acid and caustic solutions.

Aroclors give paints endurance to stand up under severe service

If you have a tough job for a maintenance paint, choose one that's formulated with an Aroclor.*

Monsanto Aroclors (chlorinated biphenyl and chlorinated polyphenyls) make paints resistant to corrosion . . . give them superb adhesion . . . make them stable to light . . . give them tough, nonporous films.

The Aroclors are used extensively in rubber-base paints for stucco, masonry, steel and wood . . . in corrosion-resistant coatings for pipe lines, tanks and chemical plants . . . in fire-retardant coatings and in marine paints.

If you manufacture paints, we suggest that you investigate the use of Aroclors' product-improvement possibilities. Information is available without obligation from any Monsanto Sales Office or literature will be sent when requested by letter. In asking for literature, please tell us the use that you have in mind for Aroclors so we can send you information that will be of greatest service to you.

• •

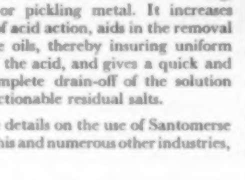
Research Chemists' Corner

You may find something new here

If you are developing something new in chemicals . . . or if you're looking for something to replace a scarce material . . . look at the properties of Monsanto Di-tertiary-amylhydroquinone. You may find the answer to your problem. If, after reading the information here, you want to experiment with the material, contact the nearest Monsanto Sales Office or mail the coupon for a sample.

DI-TERTIARY-AMYLHYDROQUINONE

Structure:



Appearance: White to buff powder.

Specific Gravity: 1.05 at 25° C.

Melting Point: 165° C. min.

Solubility: Very soluble in acetone, soluble in ethyl acetate.

Moisture: 0.5% max.

Ash: 0.5% max.

Reactions: Very weakly acidic and only partial reaction with aqueous sodium hydroxide.

Sodium salt may be formed by reaction with sodium metal in liquid ammonia.

Chlorine and bromine may be introduced into the ring.

AE-1 eliminates foam

THIS EXPERIMENT, conducted in Monsanto's Food Technology Laboratory, shows the effectiveness of AE-1, Monsanto defoaming agent. AE-1 may hold possibilities in the manufacture of yeast, textiles, adhesives, paints, steel and in other industries. If you have need for a defoamer, investigate AE-1. Mail the coupon or contact the nearest Monsanto Sales Office for details.

competitive polyethylene film . . .

liners for Rohm & Haas' revolutionary FPEB† drum-package!

VISQUEEN envelope and VISQUEEN sealing disc are photographed with the other component parts of the FPEB drum package. The assembled unit—effected by mandrelling—has been proved capable of carrying 400 lbs. of liquids successfully under all kinds of normal handling abuse.

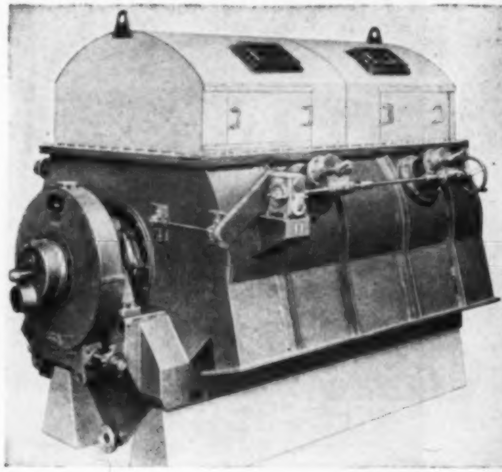
Ready for filling with 400 lbs. of nonflammable, noncorrosive liquid is this completely assembled FPEB drum-package. Note how the VISQUEEN envelope overlays the top chime of the drum. Complete product protection is provided by the top sealing disc, which is also made of VISQUEEN.

VISQUEEN film is all polyethylene, but all polyethylene film is not VISQUEEN.
VISQUEEN is the only film produced by the process covered by U. S. Patent No. 2461975. Only VISQUEEN film has the benefit of the research and extensive technical experience of The Visking Corporation, pioneers in the development of polyethylene film. Be sure. Always specify VISQUEEN film for superior tear and tensile strength and greater uniformity.

VISQUEEN FILM . . . A PRODUCT OF THE
VISKING
CORPORATION
PRESTON DIVISION • TERRE HAUTE, INDIANA
In Canada, Visking Limited, Lindsay, Ontario

This is Significant!

4 Different Filtration Problems to be Solved
4 Different Types of Filters Needed
4 Different Corrosion-Resisting Constructions



Right here, in these four different purchases, you can find evidence indicating why Oliver United is so widely considered "Filtration Headquarters." Four different companies had four different problems requiring four distinctly different filters. They got service at Oliver United.

Consider your own case. You have a filtration or clarification problem, complicated perhaps by a serious corrosion factor. Certainly you won't want to just blindly order a filter. No, you will want to (1) establish first the best filtering method, (2) determine the best filter type and size for that method, and (3) select the most suitable protection material for the contact parts.

Wouldn't it be logical for you, too, to bring your problem to the company that offers the greatest selectivity of filter types for the three basic filtering methods (continuous vacuum, continuous pressure, and batch pressure). Wouldn't this company's 43 years of greatly diversified filtration experience provide the surest background for recommendations? And the company's wide experience in utilizing the various corrosion resisting materials—wouldn't that be helpful, too? In short, sound planning says "Let's take *our* problem to Oliver United."

5 TANK STORAGE TERMINALS

Now you can cover five of America's richest markets . . . store your chemical or petroleum products with all the advantages of a private terminal. Yet *you make no investment! You risk no capital!* Valuable, modern pipelines, tanks, loading racks, docks and drumming and canning facilities are yours to use.

And as a further aid to your business, General American Tank Storage Terminal warehouse receipts represent the highest form of collateral.

For storage or distribution suggestions, call in your nearest General American representative. He will be pleased to help you.

GENERAL AMERICAN TANK STORAGE TERMINALS
A Division of General American Transportation Corporation

135 S. LaSalle Street, Chicago 90, Illinois

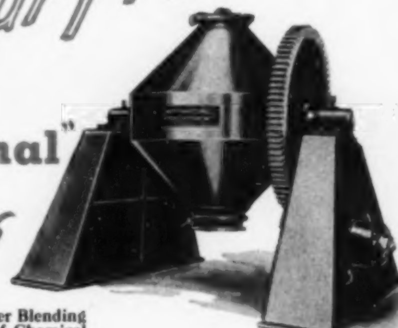
WORLD'S LARGEST PUBLIC TANK STORAGE SYSTEM

Terminals at: Carteret, New Jersey; Goodhope, Louisiana; Houston and Corpus Christi, Texas; Chicago, Illinois.
District Offices: Buffalo • Cleveland • Dallas • Houston • Los Angeles • New Orleans • New York • Pittsburgh • St. Louis • San Francisco • Seattle • Tulsa • Washington

Adapted to your Product

SPECIALLY ENGINEERED

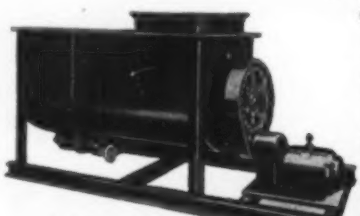
In the constant search for new ways to Reduce Costs and Improve Production—keeping ahead of demand—we believe you can profit by the experience of many important manufacturers who are using INTERNATIONAL EQUIPMENT to (1) Minimize labor and handling operations—(2) Reduce costs, space and weight—(3) Meet exact mechanical and chemical requirements—(4) Improve the finished product.



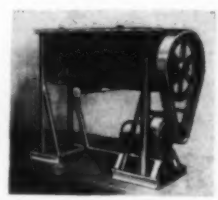
"International" DRY BLENDERS

The Standard of Lower Blending Costs for Hundreds of Chemical Products. For more rapid and efficient blending of any free flowing solid ranging from very fine mesh powder to large pebbles—particularly for the intimate mixing of pigments, colors and dyestuffs—Resin and plastic powders—Pharmaceuticals and medicinals—Food and grain products—Photographic materials—Fine and heavy chemical powders—Fertilizers—Ore or metallurgical products. *Made in many types and sizes,* ranging in capacity from 25 to 10,000 lbs. for materials having densities of from 20 lbs. to 100 lbs. per cubic foot.

"International" RIBBON MIXERS



Made in 4 different Drive Arrangements, and in 16 Standard Sizes, from ¼ to 175 cubic ft. capacity. Special Designs also available to meet specific floor space and other requirements. "INTERNATIONAL" RIBBON MIXERS are so fitted with a design relationship, outer to inner spirals, and the efficiency is such as to thoroughly mix a few ounces of one material with many pounds of another material. Heavy all welded construction. SIMPLIFIED AGITATOR REMOVAL—By simply removing bolts from companion flanges, the entire shaft containing the two spirals can be lifted out of the mill.



Send for Catalogs and Full Information on any "INTERNATIONAL" Product—no obligation.

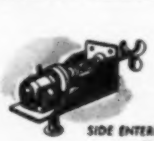
International ENGINEERING, INC.

DAYTON 1, OHIO

NEW YORK—15 Park Row • CHICAGO—407 S. Dearborn St.

TOP ENTERING MIXERS

BALL MILLS

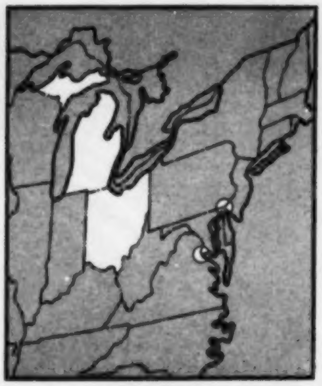


SIDE ENTERING MIXERS

PORTABLE MIXERS

Memo from the Editor John R. Callaham

MAN turning out article on p. 124.



MAP showing areas he'll concentrate on.

"Cost-Data" Chilton Joins CE

It was at the Minneapolis meeting of the AIChE, and a half dozen of us were chewing the rag just outside one of the meeting halls. I soon began to talk about my favorite subject—what kind of articles our readers like to see in *Chemical Engineering*.

"Why don't you have more on cost estimating—like the one last spring by Chilton on correlating plant cost data? Now that's a classic!" It was plain to see that the engineer from Parke-Davis meant what he said.

The fellow from Standard of Indiana picked up: "You bet it is. We were figuring on building a new plant, so just for the hell of it I checked the guy's dope; he's O.K." The plant engineer from Dow, the project engineer from Texas and the professor from Cornell all quickly agreed (as well as engineers can).

Right then and there I made up my mind that we'd go after more of those Chilton-type articles on cost estimating.

Actually, we went one better—got Cecil Chilton* himself. Then on December 7, the day after Cecil joined us as an associate editor in New York, we persuaded him to work up the short article on process labor requirements that you'll find on page 124 in this issue. That isn't all: another one'll appear next month, another in April, still another in May.

To tell you the truth, I was caught off balance when Cecil said he'd much rather become one of our regular editors than just continue as one of our authors; I had never thought of that. "How come?," I asked him.

"Maybe because writing is the next thing to preaching," he answered. (I had never thought of that, either). "I have preaching blood in my veins: my grandfather was a minister; my father, an advertising writer and executive, was a lay preacher outside office hours; and I have a brother who's a full-time minister in Alabama."

Then Cecil told me how his interest in writing had stemmed from his high school days down South. "When I finally had to make up my mind on what career to pick, journalism came darn close to winning out over chemical engineering. Guess it was mostly my admiration for Uncle Tom that swung my decision in favor of engineering. Glad it did, too."

Cecil really has the ideal background for working up more of those Chilton-type articles on cost estimating I just mentioned. His educational training suits us just fine: two degrees in chemical engineering—B.S. from Alabama Poly (1939), M.S. from Carnegie Tech (1940)—plus graduate courses at the University of Louisville and extension work at the University of Delaware.

His industrial experience was exactly along the lines we'd been looking for. After a short stint in pilot plant operations at Socony-Vacuum, Cecil joined Du Pont. He was approaching his 10th anniversary there when he tied up with us.

Cecil's wide experience and superb training with Du Pont also suits us fine. There his jobs ranged from pilot plant and research work through drafting and design to plant startup and process improvements—finally to a broadening two-year assignment on making economic studies of new processes and products. At one time or another, he was in residence at five different Du Pont plant locations and at the main office in Wilmington. We picked up our ears at all that sound training in engineering economics.

"Du Pont's one swell firm in more ways than one," Cecil says. "But I guess I'll always remember it best for something it did for me that not every employer would have done: an expense-paid honeymoon!

"It happened this way. I was all set to get married when they decided to transfer me. Naturally I got upset—until I learned that, of all places, they were going to send me to the Niagara Falls plant right at the time, of all times, that I was getting married. So my bride and I went to Niagara Falls, located an apartment, had our honeymoon there and in general behaved like any normal newly-married couple—with all expenses paid by Du Pont."

Music, I've learned, has always played a large part in Cecil's life. As a college freshman he was so eager to get into the Glee Club that he gave rehearsals precedence over chemistry lab. So much so, actually, that when he decided on chemical engineering, he had to go to summer school to make up his deficiency in chemistry!

Cecil now lives in Long Island with his wife and two children. (Florence comes from Pittsburgh—evidence that Cecil did more at Carnegie Tech than earn his master's degree.) Soon he expects to get back into another one of his favorite recreations—doing maintenance and handy work around the house.

Since Cecil's most interested in what you might call "engineering economics," we're giving him pretty much a free hand to go full blast in that direction.

* Not to be confused with Tom Chilton, Cecil's uncle, Du Pont's director of development engineering, newly-elected president of the AIChE, and our Man-of-the-Month last month.

SIDNEY D. KIRKPATRICK, Editorial Director
JOHN R. CALLAHAM, Editor

Chemical Engineering
WITH CHEMICAL & METALLURGICAL ENGINEERING

FEBRUARY 1951

A Dreary Prospect

In the old-fashioned economics we studied in college, price was supposed to be the regulator of production. If automobiles became too expensive, people quit buying them. Now we temporarily discard the automatic mechanism of free competition and substitute governmental control. We are supposed to strengthen the war effort by rolling back prices in order to stem the tide of inflation. We do it piecemeal, with no regard to damage elsewhere in the economy. And, with human nature being what it is, we suspect that black markets will soon be with us, along with senseless shortages and the petty grafting that accompanied so many of the OPA controls during World War II.

With this unsavory bit of history vividly in mind, the almost certain prospect of greatly increased control of our economy is quite discouraging. Yet it seems inevitable that once the process has been started, there can be no turning back. Therefore, it behooves industry to be prepared, to begin now to accumulate the basic data that government will soon require on cost and profit margins. The base periods for both are defined in detail in the present law, but again judging from past experience, there will be plenty of room for administrative discretion in their interpretations. All we can do is to prepare for the worst but hope for the best. Washington must have learned some lessons that will help to ease the burden we all must bear in this critical period in our country's history.

Allocating Scientific Manpower

In a war economy the two most serious shortages are manpower and materials. Both are needed by essential industries and by the armed forces. Neither will get as much material nor as many young men as it is sure it needs. So the problem of apportioning the inadequate supply between the two is a very serious issue. It is all the more important when we think of manpower in terms of the scientific and engineering brainpower needed for research and development, manufacture and application of modern materiel.

A distinguished committee headed by Dr. Charles A. Thomas and composed of 12 men prominent in education, industry and science has unanimously urged that there be a continuing flow of students through colleges and universities to take care of the nation's technical needs, for war or peace. Their recommendations made to the National Security Resources Board and through it to the President outline certain practical methods by which this might be accomplished. They do not call for blanket exemption for any class or division of society. They do not necessarily relieve young scientists and engineers of military responsibilities in cases where their technical services are needed and can be used most effectively. But it is obvious that we cannot afford to waste scientific manpower any more than we can squander our dwindling resources of strategic materials.

In return for intelligent allocation and administration of scientific manpower, both educators and their trainees have a patriotic responsibility. So too do those in industry who employ the young scientists and engineers. This responsibility is to make sure that every special skill needed in the defense program is made available for and efficiently used in work of unquestioned necessity. Such cooperation from the young men and their teachers and employers will go a long way toward winning the presidential and congressional support needed to put the Thomas Committee's recommendations into effect.

What of Chemicals in Food?

For many months Congress has been investigating the alleged hazards to the public arising from "unwarranted" use of chemicals in food. Under the chairmanship of Representative Delaney a Select Committee of the House held hearings to provide opportunity for protrated airing of views by official, industrial and professional witnesses. The results to date have been much less drastic than were feared and forecast. How they will be interpreted by the new Congress is not yet evident, but it does seem appropriate to set down a few editorial observations and possible conclusions.

First, it seems clear to us that the Food and Drug

Administration has more need for additional funds than for any new authority. Proper technical studies, which cannot be done now for lack of money, would help to insure sound and prompt action in establishing food standards.

Second, there seems to be no lack of authority for F&DA to investigate any proposed new use of chemicals in foods. But even so, it might be worthwhile to require anyone proposing such use to register his plans in Washington so that potential hazards could be checked and unwarranted proposals vetoed when public safety requires. But this can be done without setting up an elaborate "New Chemicals" section of the food law comparable to the one for "New Drugs."

Third, we fail to find in the Delaney proceedings, or elsewhere, any real evidence of lack of cooperation or reluctance of competent witnesses to assist in food investigations. Hence we doubt the need for giving the Federal Security Administration the right to issue subpoenas.

Finally, we noted with great satisfaction the keen appreciation by chemical industry of its responsibility for using new materials in foods only when they have been proved to be safe. We have never doubted the acceptance of that responsibility, but it is encouraging to find public interest now so effectively demonstrated.

Making Managers

Occasionally some chemical engineer who has been riding herd on production or research in a burgeoning industry, suddenly finds top management responsibilities thrust upon him. The change is always interesting to observe. Recently one of our friends in this predicament secretly confessed that he wished he had studied a little less about the kinetics of chemical compounds in the world of Epicurus and Mendelejeff and more about the kinetics of the dollar bill in the world of Truman and Stalin.

Some engineers go through the metamorphosis into management as gracefully as a butterfly. A few flounder pitifully because of their naiveté among the hucksters and their ineptness in solving the human equation in business. Yet on the whole most of the chemical engineering executives we know have shouldered their new responsibilities and shouldered them well. For proof let the doubter look to Wall street with its shrewd appraisal of such technically managed chemical corporations as Du Pont, Carbide, Monsanto, Pfizer—to mention but a few.

But the unpleasant fact behind all of this is that the transition could have been a lot easier. Recognizing this situation, the Alfred P. Sloan Foundation has set about to correct it—to the tune of $5.25 million for the establishment of a School of Industrial Management at M.I.T. The idea behind the school is to span the hiatus between management and the scientist. Give the guy in the glass-walled laboratory the same point-of-view as the one in the pine-panelled office, and back it up with some hard-headed business training.

When Dr. Karl T. Compton announced plans to get the school rolling with some $2.5 million of Sloan money, and with another $2.75 million on hand for underwriting its first ten years of operation, he observed that "executives with a background of science and engineering are usually well qualified to deal with the intricate problems of industrial management in our technical enterprises."

He went on to say that "Our present national situation dramatizes a recognized fact; viz., that production is both a source of economic progress and the foundation of national security. It is equally true that management is the motivating force that determines the effectiveness of production."

Ironically enough, the only thing likely to delay the opening of the school's doors at Lever House, in Cambridge, Mass., is the government's mobilization program, with its attendant shortages of men and materials. But the long-term prospects seem to be favorable and in the not too distant future we can look forward to seeing recipients of the M.I.T. degree of Master of Industrial Management. Our guess is that the lucky men who receive this sensible, practical training will be in much demand. There is room for plenty of them in the chemical process industries.

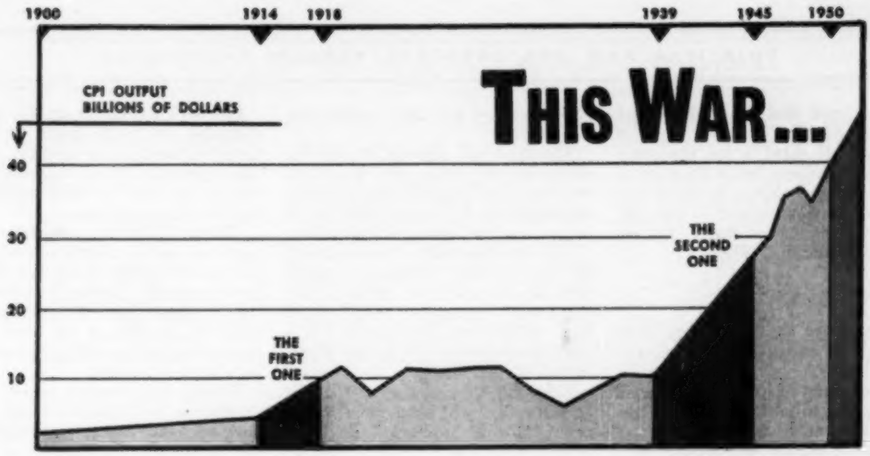
Fat Market Shrinking

Chemical developments continue to reduce the requirements for fats and oils in the United States. Two of these trends appear to be important and permanent influences. Both deserve more thoughtful consideration by the chemical industries involved.

Synthetic plastic materials have been successfully developed to provide lacquer, paint, and other surface finishes with properties definitely superior to those based on drying-oil films. Apparently this development represents a shrinkage in fat markets of about 100 million pounds per year.

Synthetic surface-active agents are being used instead of soap in a large share of the detergent market. The substitution of these new detergents will continue. It is likely that the present replacement of about 100 million pounds per year of fats by the new chemicals will grow to even greater substitution. The superior wetting properties and detergent action of the synthetics assures them of a permanent and growing place for both household and industrial usage.

At present it appears that for some time to come the industrial markets for animal fats will continue to decline rather than gain through new chemical developments. But the area is of such great importance to the process industries that any forecasting must remain highly speculative on all but one point. This point is that animal fats are commodities of continuing interest for all chemical enterprises.



THIS WAR...

...AND THE CHEMICAL PROCESS INDUSTRIES

Hell Broke Loose

It broke last year—first in Korea, then in Washington. The first shock waves are now hitting the chemical process industries from one end of the nation to the other. They'll hit harder before summer rolls around.

Korea alone didn't at first jar the nation hard enough. It took Russia's Malik and China's Wu to demonstrate—albeit so rudely—what lies ahead. Without their help we might have been only too eager, in short time, to relax and doze again!

What Malik and Wu hurled at the free world, with every twisted word and gesture, was this:

"We're at war whether you want it or not. It's a global clash of our way of life with your way of life. It's a war that has been on for years although you never actually woke up to it; we lulled you by keeping it fairly polite. But now the real battle is on; it won't stop until one of us goes down in defeat. There may or may not be wholesale hot shooting; that depends on how fast and how well one of us outsmarts the other. We don't give quarter."

So that's what we're in for: a head-on global clash with communism and its idealogy. At long last we know it. At last we're preparing for it.

In this stage of all-out preparing . . .

Who'll Be Hit?

Everybody. That means all our chemical process industries—and every company, plant and individual in them. No nation can arm as this nation is arming without the impact reaching every nook and cranny of our industrial economy.

Some process industries have been hit soon and hard; for others it will be later and easier. Some will be pinched by shortages of materials, others by shrinking markets.

All will feel the impact of rising costs, higher taxes, more government controls, a dwindling pool of technical men and labor, a wild and touchy economy, doubts and confusion in high places.

A few firms may profit; more will be hurt or crippled. All without regard to merit or justice. For that's the kind of future, hot or cold, we're in for.

For most of us, then, the big question is . . .

How Long, Oh Lord?

How long will this sorry mess of things, this state of "perpetual preparedness," be forced on us to distort our lives and to warp our economy?

Nobody knows for sure—not even Stalin. Something pleasant (or unpleasant) may happen to cut it short. Odds are, though, we'll have it with us, in one form or another, for many years. Perhaps for a generation.

For it's part and parcel of the com-

munists' creed that the world cannot bear two ways of life; one must be destroyed. If there is any constancy to Moscow's course, this is it's guide.

This is the challenge to the chemical process industries and to every responsible person in them: develop fast, use to the limit all the . . .

Ways to Win

These hinge on three things: more output, higher productivity, creative ingenuity.

More output of basic chemicals will be necessary to satisfy the war-on-top-of-peace economy that we're developing. More output will be necessary to keep prices—or inflation—from running amok.

Higher productivity will be necessary to get the most from the raw materials, facilities, labor and equipment that will be available.

But management and engineering ingenuity—competence blended with liberal shots of imagination and boldness—is the process industries' best weapon against any emergency. Creative ingenuity has always been a mark of our industry.

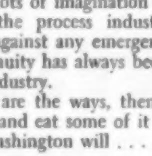
Those are the ways, then, to have our cake and eat some of it too. Provided Washington will . . .

Ring the Bell

Our industries are able and willing to go full steam ahead. They are rearing to tackle the job of turning out enough chemicals to make the hard goods of war as well as the softer goods of peace.

Their plea to the master planners and signal callers in Washington: "Tell us now what you'll want and when you'll want it while there's still time for us to do something about it."

It's up to Washington, then, to ring the bell to call the wits together—and to ring it out clear and bold.



Mobilization

It hit our industry—like most industries—with a wallop. The big questions now: how fast the drive, which way the direction?

The drive will step up, at least for the earlier part of this year. Even barring more and bigger shooting affairs, mobilization's full impact has yet to be felt by the chemical industries.

The direction will be better aimed, sharper, clearer. Wilson is giving both the drive and the direction that the country needs and business men like. As one executive put it, "Wilson's the brightest spot in the Washington picture today."

DPA and NPA are the mobilization agencies that will have most to say about chemical business. DPA is the nearest equivalent to World War II's WPB.

NPA's Joseph Bates, head of the chemical division, will keep an eye on problems of materials control. He has already assured some expanding companies that they'll be able to get critical nickel, stainless and other materials when needed.

So far, expansion of production facilities has been a large part of mobilization efforts in the process industries. One encouragement is in the form of tax benefits on "fast amortization" for plants to make such chemicals as chlorine, phosphorus, alcohol and sulphuric acid. But as of mid-January, only one chemical firm had the all-clear sign for this 5-year "fast amortization."

Chemical process industries hit first and hardest by mobilization: synthetic rubber, benzene, alcohol, petroleum alkylation, sulphur, light metals, atomic energy.

Law & Government

Korea crippled, but didn't kill, Washington's politics-as-usual. The big anti-monopoly guns have been muzzled (we need industrial giants for our defense program) but behind the scenes the sniping goes on.

Talk about a basic overhauling of pollution laws continues. Truman's Water Resources Policy Committee has recommended more power to Public Health, federal funds to help finance a cleanup.

Delaney's committee on the use of chemicals in foods hopes to continue for another six months. Probable recommendation: demand proof—proof by Food & Drug standards—that they're safe to use.

Chemical "growth companies" can apply for special treatment under the new excess profits law. But they've got to convince Internal Revenue that "rapid growth" holds for them. It won't be so difficult for those companies that have struck a recent bonanza in new products.

During 1951 you can expect more regulations and controls, higher taxes that will stay high, tariffs that will allow some chemicals to enter at 30-50 percent lower duty, more wrangling on who owns what's worth owning under the tidelands.

Plants & Processes

This year will be the chemical industry's biggest for investments in new and expanded production facilities. The figure will probably tot up to $1,500 million—20 percent more than for 1950. That's head-and-shoulders above any other manufacturing industry.

Major new plant expansions that were announced or under way last year were in these fields: synthetic fibers, acrylic chemicals, acetylene, phosphorus, the polyethylene resins, carbon black, sulphuric acid, pulp and paper, titanium dioxide, aluminum and magnesium.

Interest in new process developments centered around benzene from petroleum, acetylene, fats and oils, the light metals and synthetic organics. There was a sudden stir about sulphur and how to get it economically from other sources; real progress on this can soon be announced.

But progress was made in developing processes for getting benzene from petroleum raw materials. Several plants are now operating; others will probably go in this year.

In the caustic field, mercury-type cells got plenty of attention. Several new installations were announced.

In the pigments field, the year's

biggest development was a new commercial smelting process. It turns out a high-TiO_2 raw material from vast Canadian ore deposits.

Labor

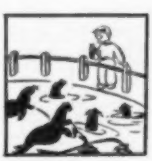
What looked like a temporary surplus of chemical engineers near the year's beginning has turned into a sudden and painful shortage. The worst is yet to come, for the dearth of engineers of all types is a long-range crisis of the first magnitude.

Many authorities believe that this long-range shortage of engineers and scientists may actually hold our technological progress to a dangerous plateau. In numbers, Russia's new crops of scientists are already surpassing ours.

Employment in the chemical industries has shot up to a record level. So have wages. Both are still climbing.

The nation's pool of available labor is being drained fast. There will be local areas where the labor supply will stay fairly easy, perhaps in slight surplus for brief periods of readjustment. But mostly it will grow tighter. Some smart personnel men are already eyeing the ladies.

Things to look for in the labor situation during 1951: (1) Something like a War Labor Board to settle major disputes; (2) a stepped-up drive for members by the chemical unions; (3) pirating efforts by war industries for workers; (4) possibly a no-strike pledge in exchange for higher wage patterns and other concessions; (5) government efforts to stabilize wages and labor.



Supply & Demand

The chemical industries are faced with a big problem: how to raise their output so as to bring it closer to the demand. That will not be easy; the industry is now operating close to the limit of its productive capacity. And it takes time to put in new facilities.

Most chemicals established a definite pattern last year: plentiful during the first few months, firming before summer, tight as a drum by the end of the year.

Allocation of industrial alcohol is in the cards; this means a cut in beverage output. There simply isn't enough industrial alcohol for an all-out synthetic rubber program and for military needs placed atop booming industry demands.

With less violence, methyl alcohol repeated ethyl's performance; from abundance to scarcity.

Demand for polyacrylic fibers reached the 28-million pound mark. This, we predict, will be more than quadrupled by 1955. That will naturally call for large volumes of raw materials, with repercussions throughout whole segments of the chemical industry. Can the supply of chemical raw materials keep up with the demands for the fiber? New facilities are going up, more will be needed.

Chlorine kept up its spectacular rise of recent years; some 75 percent now goes into other chemicals. Demand for caustic went up, is still climbing.

Even problem-child muriatic pulled a comeback; output climbed to 700,000 tons. Interest in this acid as a source of chlorine is picking up.

The supply picture for most basic chemicals during 1951 can be brushed in with broad sweeps: a continued tightness that will probably reach its climax shortly after midyear, spotty and erratic dislocations of some products, a more clear-cut supply-and-demand pattern by next winter.

Profit & Loss

Profit-wise, last year was a whopper. In almost all cases earnings were well above the 1949 levels.

Du Pont's increase in net income was one of the most impressive in the whole industry. The rayon industry showed a nice comeback from 1949's letdown. So did several other segments of the industry.

A few firms didn't fare so well. Allied Chemical was one of the big ones that showed a sales gain over last year of only about 10 percent. The labor strike against Solvay and other ash producers was a crippler.

Chemical stocks have shot upward. Early in the year Standard & Poor's chemicals index stood at 160; by the end of the year it had hit 200. In contrast, all industrials just reached 170.

Excess profits taxes will cut deeply into 1951 earnings on a percentage basis. But dollar-wise, earnings may well reach—and in some cases surpass—1950's finals.

Prices

Korea and what has followed blew the lid off chemical prices. We are now paying almost 18 percent more for chemicals than this time last year.

Price hikes were spotty, of course. Some of the big jumps were in such products as benzene (up some 50 percent), phenol and benzene-derived chemicals.

The hike in sulphur prices will probably go down as the year's most historic; repercussions were fast and widespread. Sulphuric acid followed. Most of all, though, sulphur's jump focused immediate attention on a real problem, "Twenty years or so from now, where can we get cheap sulphur?"

The rubber-for-war program, international politics and a lot of other factors jacked distillers' alcohol up some 300 percent in one of the most intriguing price stories of recent years. Other alcohols and solvents naturally got a lot of kicking around in the fray.

Fats and oils kicked up all over the place. They had more kicking room, of course, since they started off at one of their lowest points in receent years.

Cottonseed oil doubled. So did corn, soybean and others. Soap-lye glycerine tripled.

How well can prices be kept under control? That's the $64 politico-economic question of the year.

MOBILIZATION

NPA's Mullen (attorney), Bates (chief), Markwood (inorganics).

AGENCIES & CONTROLS

Experience Makes ODM

Chemical men wondering about future government controls can rely largely on the industry's experience in World War II. In most respects, you will find that the controls devised then will be put to use again during the mobilization period ahead.

Now that Charles E. Wilson has become assistant President in charge of every phase of the mobilization, you can expect more drive and direction, less backing and filling from Washington.

At present Wilson plans to have only a small staff for his Office of Defense Mobilization. For instance, he isn't likely to have a chemical man, specifically, in his shop, although he already has one materials expert, Fred Searles, a well-known mining and metals man.

DPA & NPA

Agencies having the most impact on chemicals will be the Defense Production Administration, headed by William H. Harrison, and the National Production Administration, headed by Manly Fleischmann.

Defense Production Administration is the nearest equivalent to the War Production Board of World War II. Its job: establish over-all production priorities, determine program cutbacks if necessary, determine plant and production expansion, estimate labor requirements, and "secure production plans from all agencies and develop methods and procedures for their execution." Harrison's DPA, in fact, is the boss, under Wilson, of all mobilization except economic stabilization, labor, and credit controls.

Chemical executives will be dealing mainly with the Chemical Division of NPA, and the petroleum, power, and minerals and metals agencies that were at first under the Department of Interior. All these agencies now operate under directives from Harrison.

DO

At the outset, materials control problems handled by the National Production Authority were largely metal problems. Mostly it boiled down to:

How do we build a stockpile of scarce non-ferrous metals, and how do we make sure that defense orders get filled on schedule?

The answer was to give military prime contractors a priority to get the materials and components they needed to fill the defense (DO) orders.

The chlorine order was the first one to be prepared for any widely used basic chemical. However, NPA's chemical branch has had to keep an eye on scores of critical supply situations on a wide variety of chemicals. At first, it had been able to take care of the chemical industry's critical needs—and the needs of essential users of chemicals—through informal arrangements with the sources of supply.

For instance, the aluminum cutback order would have hit several industries hard: aluminum chloride is used for dyes and detergents; and zinc compounds are important drugs and pharmaceuticals. NPA through informal and "hardship" procedures was able to keep such needed production unimpaired by the general across-the-board cutbacks in the consumption of these metals themselves.

Similar procedures have been used effectively by NPA to get scarce materials for chemical plant expansion. A few tons of nickel, for instance, are required for expanding chlorine production facilities—and chlorine has been perhaps one of the most important chemicals that's been short. NPA's Chemical Division, under Joseph S. Bates, has been able to assure expanding companies that nickel, stainless steel, and other scarce equipment would be available when needed.

EXPANSIONS

Tax Benefits

Expansion of chemical production facilities is a key to the whole future of chemical mobilization.

Government encouragement, in the form of the tax benefit of five-year amortization of plant costs, has been approved by NPA's Chemical Division for many new facilities—mostly for such items as chlorine, alcohol, elemental phosphorus, and sulphuric acid. The government's object: to expand production to the utmost as a means of fighting inflation and supporting our huge new demands for arms.

There's no doubt that many chemical companies, large or small, are applying for—and are getting—this tax benefit, just as U. S. Steel used it in connection with its new \$350 million, 1.8 million-ton East Coast steel mill. (The steel projects given amortization already provided, at year's end, 3 million additional tons of coke capacity.)

However, of the 50-odd companies whose expansion programs were given "fast amortization" by the National Security Resources Board by mid-January, only one was readily identifiable as a chemical project: the \$805,-000 facilities of the Tennessee Products & Chemical Corp., Nashville.

Directed Distribution

Future expansion of basic chemical production and informal agreements on sharing available supplies can't be counted on to solve all the chemical controls problems.

NPA had to step in and direct the distribution of certain chemicals in order to prevent certain essential industries from bogging down. NPA's first directive provided:

1. Several tank cars of vinyl acetate monomer to be used for the production of polyvinyl alcohol needed for textiles and adhesives.
2. Directed that a supply of vinyl acetate monomer be given producers of milk cartons.
3. Limited fiberboard box makers to 25,000 lb. of polyvinyl alcohol for fiberboard boxes made during January.

Until such time as general controls are exercised over all chemicals, you can expect a growing number of similar "directives" from NPA—each designed to make sure that some essential industry doesn't break down for lack of chemicals that are completely tied up with DO orders.

In the offing, however, is a return of M-300, the general order that governed chemicals during World War II. This order specified the reports required from users and producers of chemicals, fixed the shipments, inventories, and end uses to which specific chemicals might be put in what quantities.

Experts indicate that if copper, aluminum and steel go under a controlled materials plan—as has been generally predicted—then you can expect M-300, or something like it, to be in force. A CMP for metals is expected by July.

Actually, chemicals men are plugging for an M-300 setup as soon as possible, regardless of what happens to controls on other materials. Their argument: it's not too early to begin building up the mechanism again.

Anti-Hoarding

Control over 14 chemicals is now exercised by NPA through a double-barreled system involving inventory control and anti-hoarding regulations.

Scarce chemicals went under NPA control on September 18 through NPA Regulation No. 1, which provided for a "practicable working minimum" inventory.

On December 28, through NPA Notice No. 1, a dozen chemicals—benzene, carbon tetrachloride, dichlorobenzenes, glycerine, methanol, methyl chloride, methylene chloride, phthalic anhydride, polyethylene, styrene and polystyrene, titanium pigments, and trichloroethylene—were made subject to anti-hoarding provisions of the Defense Production Act. A number of metals and minerals were included in the anti-hoarding notice.

The Defense Production Act defines hoarding as an act in which materials are accumulated in excess of reasonable demands of consumption, or for the purpose of resale above prevailing market prices.

Through an amendment to the NPA Notice No. 1, NPA on January 11 added industrial ethyl alcohol and chlorine to the 12 chemicals. Also added were other strategic items such as zinc dust and oxides, natural and synthetic rubber, paper, paperboard, lumber, plywood, and wood pulp.

Methylene chloride is subject to a special order (M-21) which permits only the "paint remover grade" to be used for making paint remover and dry cleaning aids. Refined grade requires a written certificate that such type will be used exclusively for making of photo film, or medical or industrial X-ray film. Methylene chloride is short because large amounts are being used in paint remover for demothballing Air Force planes.

Action Impending

Action by NPA will be coming in the near future on three chemicals—benzene, barium carbonate and sodium bichromate. Three industry advisory committees are digging into the supply and demand situation on this trio of chemicals.

When organized in mid-December, the benzene committee was told to get out and get facts on production and consumption upon which future distribution could be based. It was due back late in January with at least some of the answers.

The barium carbonate group got started in January; it's rounding up the statistics needed for the framing of an order assigning DO-rated orders among producers and distributing supply among users.

The sodium bichromate people got together for the first time late in January.

Action is also forthcoming in the pigment industry. Five task groups organized in January are now studying supply and demand and the impact of DO-rated orders. The task groups are: (1) titanium pigments, (2) organic and inorganic chemical colors, (3) mineral colors, (4) metallic pigments, and (5) lead and zinc pigments and antimony oxides. Titanium pigments are short because sulphuric acid is short. NPA says sulphur producers are voluntarily allocating their customers 85 percent of current contracts.

DIRECTION

NPA Big Shots

Chief of NPA's Chemical Division—and the front man for the industry in the controls program—is Joseph S. Bates, president of the Bates Chemical Co., Pennsylvania dye-making concern.

Bates, before taking his present government job, had served before with the Chemical Division of the War Production Board and has had several other high chemical posts with the government.

In 1940, he became a Lieutenant Colonel in Army Ordnance, after which he went to WPB. Later, when the government seized General Aniline & Film, he was named executive vice president of the firm. In 1945, Bates was chief of a special War Department mission surveying I. G. Farben properties in Germany, and on Jan. 1, 1947, he became president and director of Ciba Pharmaceutical Products, Inc.

NPA's Chemical Division is being staffed as fast as personnel can be rounded up. Assisting Bates is Charles C. Concannon, chief of the chemical division of Commerce Department's Office of Industry & Commerce.

Bates' staff assistant and trouble shooter is John A. Gosnell. Formerly with Coca Cola, Gosnell was "man of many talents" in the World War II Defense Supply Corporation. Gosnell is a lawyer and has a broad background in a number of lines.

NPA has also assigned attorney Roger Mullen to the Chemical Division.

A programs and statistics section is operating under Francis F. Hoffheins, formerly with the Commerce Department's chemicals and drug section.

Louis N. Markwood heads the inorganic chemicals section. He handles agricultural chemicals and insecticides as well. Markwood was for a number of years with USDA on agricultural research and the U. S. Tariff Commis-

LAW & GOVERNMENT

sion as an expert on chemicals. Since 1942 he's been with Commerce.

Lowell B. Kilgore heads the plastics section. He has been in the chemical field, running his own businesses, for more than 20 years. During the war he was with WPB, and later with Commerce.

Frank E. Bennett is chief of the alcohol, solvents and drug section. Bennett has been sales manager in the New York area for industrial products of Publicker Industries, Inc., for the past three years. During World War II he was with WPB on alcohol and solvents.

Louis A. Schlueter is chief of aromatic chemicals section. Up to his appointment, Schlueter was for three years a staff member of the American Coke & Coal Chemicals Institute in Washington. Schlueter is another ex-WPB man. Immediately after the war he was general production manager of Susquehanna Chemicals Co.

Wesley R. Koster, formerly with the chemical division of Commerce, is handling acids, salts and compressed gases. An ex-industry man, he has been with Commerce since 1942.

Other sections will apparently be formed as soon as qualified people are recruited. Immediate need was for 30 or 40 young chemical men from industry to staff the Division's sections that were just getting organized. For instance, experienced junior executives are needed in plastics; alcohol and solvents; acids, alkalis and heavy chemicals; dyestuffs and detergents; and drugs and pharmaceuticals.

BYPRODUCTS OF KOREA

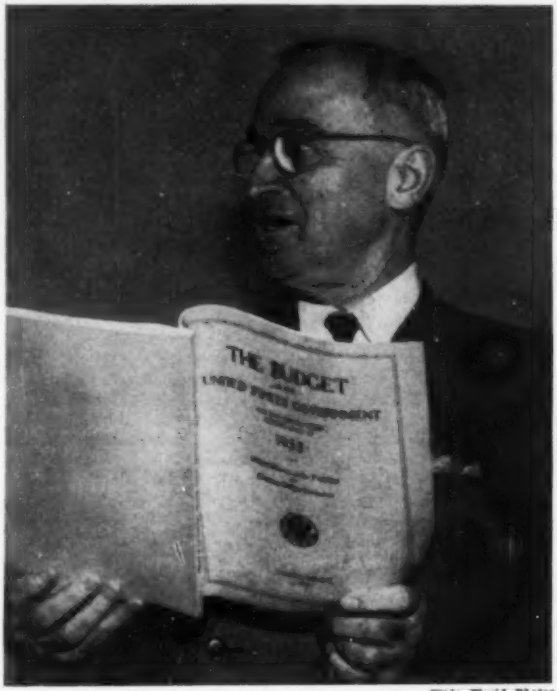
Squeeze in synthetic rubber is now pretty well under control.

Needs for industrial alcohol, both for synthetic rubber and for armaments, will curtail, and possibly stop altogether, production of beverage alcohol. Plans are going forward to prepare an order to this effect.

Another critical item has been alkylates, needed both for synthetic rubber and aviation gasoline.

Much of the tetraethyl lead production will have to go into aviation gasoline. It's unlikely refiners can get enough to keep on upgrading both military and civilian gasoline.

NPA's Chemical Division has been warned by producers and consumers that the U. S. will have to find new sources of benzene. They urge agreements under which the U. S. can get substantial amounts from Europe.



Wide World Photos

TAXES

Look Up!

Taxes will be increased before summer. Another levy will be placed on individuals and corporations. Taxes right now are figured to bring in around $45 billion a year; goal of the new law will be to hike that take up to $55 billion.

Experts say that if taxes go up in the same proportion they did in World War II, revenue would hit $75 billion. And Truman's advisors figure the country could stand that kind of load without real trouble. Truman is already thinking about a tightening up of the excess profits tax law, finally enacted on the last day of the 81st Congress. It's effective on earnings back to July 1950.

The excess profits law boosts the regular corporate income tax to 47 percent, adds a surtax of 30 percent on so-called excess profits. These profits will be measured this way: earnings above 85 percent of those for the average base year.

Most businesses will use a base period of 1946-1949. But many of the new chemical firms that have started since 1946 won't have a history of profits in those years. So they may use the average base of the industry.

Growth companies also get special treatment. Congress has offered to let these take their choice of: (1) an average of 1948 and 1949 earnings; (2) 1949 earnings alone; (3) 50 percent of 1949 income plus 40 percent of 1950's; or (4) 50 percent of 1948 earnings plus 40 percent of 1950's (available only to "new products" companies whose 1949 earnings are less than 25 percent of 1948's).

Prove It

Now some chemical firms may try to use the concessions that growth formula figuring provides. But they will have to convince the Bureau of Internal Revenue first that they are, in fact, a "growth company." That may not be easy!

Here, in brief, are standards the

companies must meet: small firms (assets of less than $20 million during the 1946-49 period) must show a 30 percent increase in payroll or a 50 percent increase in gross receipts in 1948-49 over 1946-47.

Larger firms must show a 50 percent increase in the rate of net sales in the last half of 1950 over net sales in 1946-47. Moreover, 40 percent of the higher sales must be due to selling a product that was not generally on the market before 1945. And the company's sales of the product must be 20 times greater than in 1946.

TARIFFS

Lower Wall to Leap

Although tariff negotiators from 32 countries have been in session at Torquay, England, since September, little has been made known on their progress. The meetings are expected to continue through the first quarter of this year. As many as 30,000 chemical items can come up for negotiation. The conference heralds the "third round" in postwar tariff cuts—which may be as high as 50 percent on some items.

But apparently there have been leaks. An important coal-tar intermediate used in dyestuffs manufacture has been quoted in the New York market at a price based upon an appreciable reduction in tariff. Are foreign traders picking up leaks on concessions that either have been made or are expected? Yet the U. S. Tariff Commission says, "All negotiations going on at Torquay are confidential."

The U. S. State Department wants no part of technical advisors from industry at the tariff sessions in England. What part of the industry, State asks, would an advisor speak for? He might sell one of the 30,000 chemical items down the river. What's more, says State, if management were represented, labor and farm groups would have to be. And finally, why let pressure groups in on what, after all, is supposed to be a crusade to expand world trade?

Chemical executives did get a chance to protest tariff cuts on chemicals when they appeared before the Committee for Reciprocity Information in Washington last May. Tariff reductions on chemicals at this time, they pointed out, could hamper the national defense effort. Chemical labor unions teamed up with management to oppose the cuts.

TIDELANDS

Who Owns Them?

The 14-year battle between the federal government and the coastal states over control and ownership of the tidelands and their underlying oil and gas deposits will erupt again. Whether it will be finally settled during the coming two years still remains in question.

The states already have been soundly defeated in their court fight. But they are ready to renew their drive to get back complete ownership and control of the tidelands. A few conservatives from the coastal states are apparently willing to go along on one plan that would divvy up revenues from the oil and gas between the federal and state governments yet permit the states to retain nominal control over production except in emergencies.

While the Supreme Court has ruled in favor of the government, there is still no law that permits Interior to issue new leases or control drilling and production in the offshore lands. Interior officials have already indicated that they would be willing to compromise some of the issues.

Texas and Louisiana have had their anger aroused even more by action of Solicitor General Philip B. Perlman. The states had won at least a partial victory; then the Court ruled against Justice and fixed the date of accounting by the states as June 5, 1950, rather than June 27, 1947, the date of the California decision, which Perlman had asked.

At issue are revenues from leases and royalties during that period: about $30 million for Louisiana, $8 million for Texas.

CHEMICALS IN FOODS

What Is Health?

After three months of gathering evidence on the hazards to health of chemicals in fertilizers, pesticides and food ingredients, the House's Delaney Committee filed its preliminary report at the opening of the new Congress. It also asked for authority to continue its investigations another six months. This will probably be granted.

Delaney's Committee wants to gather more testimony before it acts on the recommendation of the Food & Drug Administration that the Food, Drug & Cosmetic Act be amended to require the testing of new chemicals used in foods before the marketing of these foods.

Of the 704 chemicals used in foods today, the Delaney Committee reports, "only 428 are definitely known to be safe as used."

Do chemical pesticides poison food crops? At least four that have come into widespread use in recent years have been found hazardous, the committee says. The four: DDT, chlordane, selenium and phenyl mercury compounds.

Chemical fertilizers get a clean bill of health from the committee. In use in this country for about 100 years, they've caused no ill effects to man or animal.

One thing the Delaney group does want to hear more about, however, is the use in foods of chemical emulsifiers. It's been charged that the baking industry has halved the fat content of its products by using them. Atlas Powder Co., for one, has a big stake in the outcome of these hearings on emulsifiers.

STREAM POLLUTION

Cooke's Voyages

The Administration plans to ask Congress this spring for a complete overhaul of laws on stream pollution. Legislation will be based on findings and recommendations of the President's Water Resources Policy Commission, headed by engineer Morris L. Cooke. Any new legislation will influence the operations of chemical companies.

Major U. S. rivers, the commission found, suffer from heavy pollution loads. Some examples:

The Ohio. Into it pour mine drainage and sulphuric acid, and the industrial and domestic waste of the Monongahela, Allegheny, Mahoning and other tributaries. Pollution is so great as to discourage further industrial expansion—"Factories in need of water for processing or cooling purposes are tending to locate elsewhere."

The Merrimack. This New England river has been "so fouled by sewage and factory discharges that clammers rinse their catches in salt water or chlorinated water before selling them."

The Connecticut. More than 100 cities and 300 industries pour sulphite waste, acids, dyes, cyanides, ink and other wastes into the river.

The Commission told Truman:

"Pollution is proceeding faster than measures of rectification."

Points That Will Make History

Since improving pollution control costs so much, the Cooke Commission recommends use of federal funds, direct and in low-interest loans, to finance a cleanup campaign. But it also recommends that the Public Health Service be given powers broader than it now has to enforce the 1948 act. (The federal government now has only this original enforcement power: the conduct of public hearings.)

Here's what the Water Commission proposes:

1. Pollution should be considered as a fundamental part of any river basin development—along with flood control, hydroelectric power and navigation.

2. Private industry, cities, states and the federal government should get together and set a 10-year goal for a complete cleanup.

3. Public Health should get adequate funds to test federal laws; federal loans to municipalities should be made available at not more than 2 percent interest to cover entire cost of constructing sewage treatment works.

4. Release of water should be so regulated to make fullest use of a stream's potential self-purification capacity.

Maryland's Teeth

Maryland's Water Pollution Control Commission in 1950 issued its first orders under the state's recently enacted water pollution control law.

The city of Cumberland, West Virginia Pulp & Paper and Celanese were ordered to have specifications and contract plans for adequate waste treatment facilities ready by March 15, 1951. And these facilities must be in operation by September 15, this year.

It acted, the Maryland Commission says, because of the "grossly polluted condition of the North Branch of the [Potomac] river and the need for a progressive program of abatement in the region."

Pulping: Heat's On

Oregon and Washington are putting the heat on pulp and paper companies to reduce sulphite pollution in streams. Early in 1950, Washington's State Pollution Control Commission set a September 1951 deadline for four companies to stop polluting state waters; it's unlikely the deadline can be met. Plants affected: Rayonier's at Hoquiam, Weyerhaeuser's and Soundview Pulp's at Everett, Crown Zellerbach's at Camas.

To lick stream pollution, Crown Zellerbach is investigating ammonia pulping at Lebanon, Ore.; Weyerhaeuser at Longview, Wash., is studying magnesia pulping. Conclusive results aren't in yet.

Pollution control agencies of these two states will naturally try to get the paper companies to adopt either the ammonia or the magnesia process or some other system. That's unless stopgap measures the companies are now using prove acceptable on a permanent basis.

ANTI-MONOPOLY

So Sorry (Right Now)

Mobilization has, for sure, halted the government's drive to break up big business organizations like Du Pont, General Electric and U. S. Steel.

These giants are far too important to the military program to put them through the wringer now—even if Justice could do it with a flip of the wrist. Paradoxically, it was to Du Pont —which Justice claims is too big—that the government turned when it needed someone to make the H bomb.

Already, there's been a five-year suspension of a reorganization order against GE. And the Du Pont breakup suit hasn't been docketed at all.

But don't take this to mean that anti-trust activities can be counted out. Truman has just signed a bill (H.R. 2734) to close a loophole in the Clayton Act which had permitted corporate mergers through the purchase of physical assets. This gives new breadth to the Federal Trade Commission, which has battled 25 years to get the law.

Immediate effect of the new law: killing off of a planned merger of Minnesota Mining & Manufacturing and Carborundum Co. Three-M had planned to absorb Carborundum. But the new law doesn't permit mergers that lessen competition in a field—in this case abrasives.

The two companies already had accepted a consent decree from the courts ending a license and patent pool.

So FTC and the Supreme Court will be making more anti-trust decisions this year and next than Congress will. But they hit just as hard.

Little Things to Watch

The Supreme Court has been tightening up in the last year on rights of patent holders and price fixing by patent holders. In its first decision of the new year, the Court ruled that competitors can't get together to fix resale prices of their products.

The Court reinstated a $1 million treble damage judgment in favor of Kiefer Stewart Co., Indiana wholesale drug firm, against Seagram and Calvert distillers. The charge: the distillers had tried to control the dealer margin of profit by fixing a maximum wholesale price.

Chemical companies, like all business, are going to have to be careful about running afoul of the anti-trust laws—even when they get together to do something for defense.

In World War II, it took only a nod from Washington brass to bypass the Justice Department. But this time, the Attorney General is the man to say whether a group can get together to allocate materials, or decide other policies that normally might be in violation of the law.

Important Point 1. Congress has provided that 10 days before any voluntary action can be taken, the program must be submitted to the Attorney General for approval.

Important Point 2. The approved program must be published in the Federal Register—thus giving official notice of what's going on.

Anti-monopoly is still good politics even though a real trust-busting campaign has to be put off for a while.

INTERNATIONAL TRADE

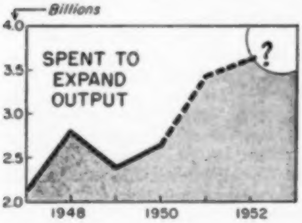
Watch and Wait

Legislation on an International Trade Organization Charter—opposed by the chemical industry—won't be submitted to this Congress. An earlier ITO bill was buried in committee for months.

But the Administration will press its Customs Simplification bill, also opposed by large segments of the chemical industry, and try to extend and implement the General Agreement on Tariffs and Trade.

Attempts to legalize and extend GATT will be made when the Trade Agreements Act comes up for renewal in the 82nd Congress. Under its present terms, the act expires next June 12. The chemical industry will eye this new legislation carefully.

PLANTS & PROCESSES



MORE THAN EVER

A Signal Was Given

In 1951 the chemical industries will shell out more on new plants and equipment than ever before. A survey made by McGraw-Hill's department of economics shows that the chemical-group companies plan to invest $1,500 million or 23 percent more than 1950's record $1,220 million. Outbreak of the Korean war gave the signal for this new surge of expansions.

The about-face in the petroleum refining industry is even more remarkable. A year ago the oil companies planned to cut 1950 investments for new facilities by 17 percent. Actually they spent within 4 percent of their 1949 figure. This year they plan to spend at least $775 million—20 percent more than for last year.

Among the manufacturing industries, the chemical group stands head-and-shoulders above all others in the amount of money it intends to invest in plant expansions during 1951. The petroleum refining industry ranks third—between the automobile and food industries. Actually, three processing industries—chemicals, petroleum and foods—will account for close to 35 percent of all capital spending by manufacturing industries this year.

Other process industries that plan major expansions: pulp and paper, glass, and aluminum. In addition, replacement of obsolete coke ovens at a rapid clip is now an essential part of the steel industry's program for modernization.

Looks big, this program for spending so much money to get more chemical output? Yet it'll probably get bigger before the year ends; for one thing, these figures do not include plans for plant expansions to handle special defense orders.

GOING UP—AND FAST

Phosphorus

New and bigger phosphorus furnaces are going up all over the country. Main reason is that phosphorus compounds have found "growth uses" throughout industry: as builders in synthetic detergents, in plasticizers for vinyl resins, as a raw material in making parathion, in high-pressure lubricant additives. Even many of the orthodox outlets for phosphoric acid and its compounds seem to have taken on new life.

Now it's certain that war needs will up the demand for phosphorus even more—probably at the expense of some peacetime products.

Monsanto and Victor are the two largest producers of elemental phosphorus; each has some 35-40 percent of the nation's productive capacity. Each is expanding. The trend is strong toward bigger furnaces, higher voltages, increased efficiences.

Virginia-Carolina and Westvaco, as well as Monsanto and Victor, have expanded to help meet the national need for more phosphorus (see table).

Meteoric Acrylics

Even before Du Pont completed its new continous filament Orlon plant in South Carolina, plans were announced for a mere $20 million expansion. This will accommodate facilities for making the staple fiber.

Plant for another new acrylic fiber, Chemstrand, is now going up in Alabama. Meanwhile, Carbide is doubling the capacity of its dynel unit at S. Charleston to 4-5 million pounds annually. There's a chance that this may go to as high as 40 million pounds in a new plant. Acrylic fibers are likely to slash into wool for military textile purposes.

What about acrylonitrile, basic raw material for acrylic fibers? Right now Cyanamid is the only producer. But Carbide and Monsanto will soon be large producers at three plants in Texas and West Virginia. Monsanto's $30 million installation at Texas City will use acetylene as basic raw material. The two other producers use—or plan to use—ethylene oxide.

Process-wise, interest centers on Monsanto's method of getting its acetylene by thermal cracking of methane in natural gas. This is brought about by partial combustion of the gas with oxygen from a Hydrocarbon Research plant with a capacity of 700 tons per day. That's tonnage oxygen, of course.

Monsanto will react acetylene catalytically with hydrogen cyanide to get acrylonitrile. The cyanide itself will be made by reacting methane in natural gas with ammonia.

Other Synthetic Fibers, Too

Nylon capacity just keeps on growing—so do the demands for it by industry and mobilization. Nor is the end of either yet in sight.

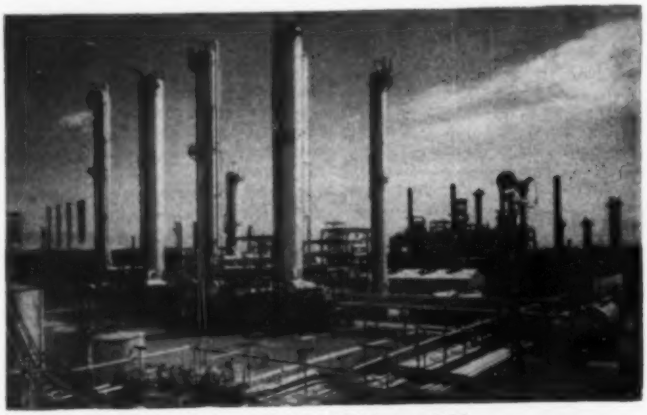
Facilities for more nylon are going in at three big Du Pont plants in Delaware, Tennessee and Virginia. The new nylon intermediates plant in Texas is well along; capacity at Niagara Falls is also being enlarged. Very significant is the fact that the Texas plant will make nylon salt from butadiene by an entirely new processing method.

One big expansion plan for rayon came out during 1950. This was American Enka's $9 million program for its two mills in North Carolina and Tennessee. Tennessee Eastman is upping its cellulose acetate yarn capacity about 5 percent.

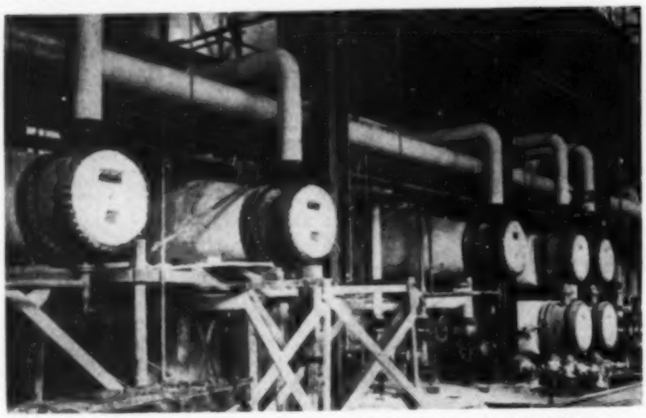
Stauffer Chemical has about completed a new plant that will supply American Enka with carbon bisulphide. The big process development is bisulphide, however, is Barium Reduction's use of the Pure Oil method that utilizes methane and sulphur vapors as the principal raw materials.

Vicara—a protein-base fiber made by Virginia-Carolina in Connecticut—is going strong. So V-C plans to put in the equipment for making more of it. It looks as if Vicara will become the first "really successful protein-base fiber to be produced commercially in this country," as one textile man put it.

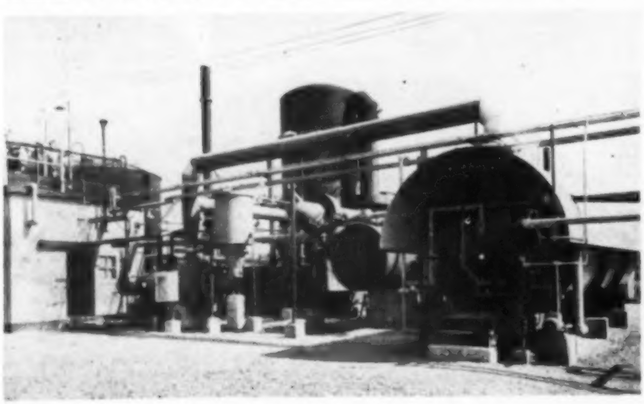
Everybody, of course, has been watching Du Pont's Fiber V and wondering what DuPont's next move will be. Now the answer is known: it will be made in a big new plant near Kinston, N. C. (which, incidentally, was originally slated to turn out nylon). Fiber V is made from ethylene glycol and terephthalic acid (same as ICI's Terylene).



SYNTHETIC BENZENE. Shell Oil Co., Wilmington, Calif.



SULPHUR FROM NATURAL GAS. Texas Gulf Sulphur Co., Worland, Wyo.



SULPHURIC ACID. American Cyanamid Co., Hamilton, Ohio.

RESINS, PLASTICS & RUBBER

Four-Star Polys

Outstanding development in the resins and plastics field during 1950 was the continued expansion of the big "polys"—polystyrene, polyethylene and polyvinyls. Altogether, some 20 construction projects were under way in the entire resins and plastics field.

Monsanto and Dow were the leaders in polystyrene; Du Pont and Carbide in polyethylene; Carbide, B. F. Goodrich, Goodyear, U. S. Rubber and General Tire and Rubber in the vinyl resins.

Shell Chemical is starting up a plant to produce a new line of resins—Epon, by name—for surface coatings. The process, developed by Shell and Devoe & Raynolds, reacts epichlorhydrin, acetone and phenol to form resinous polyhydric alcohols. Outstanding properties of the Epons are good ahesion, flexibility of the cured resin and chemical resistance.

Rubber Snaps Back

All government synthetic rubber plants are now already in production or to be reactivated soon. The same is true of government-owned butadiene plants, whether based on petroleum or on alcohol.

That means the industry soon will be turning out synthetic rubbers at the rate of 929,000 long tons a year. Of this, some 760,000 tons will be GR-S. Most of it will probably be of the "cold" type normally made by a continuous process. Half of the government's 14 GR-S plants have already been converted to the cold process.

The sad shortage of benzene has curtailed the step-up of the styrene program. However, the Dow-operated government unit at Los Angeles is going ahead with plans to increase its monthly output from 7.2 to 9.0 million pounds of styrene.

And don't forget neoprene; Du Pont is already increasing capacity of its neoprene rubber plant at Louisville.

Phillips Petroleum is developing a process for making styrene-less or polybutadiene rubber. The product, which shows considerable promise, is now being extensively tested.

Five projects are under way to increase output of carbon black, primarily for the rubber plants (see table).

SULPHUR & SULPHURIC ACID

Kings on a Shaky Throne?

In more ways than one, our American inorganic chemical industry hinges on Frasch-minable sulphur. But at our present rate of using it, this sulphur may peter out within two decades or so. Meanwhile the demand grows every year.

Naturally there is great interest in processes for recovering sulphur from other sources. It's true that more use is being made of ways to recover it from natural and refinery gases. Yet these will probably never be able to turn out more than a rather small percentage of our total sulphur needs.

No obvious, simple and economic solutioin is in sight. Therefore the new plant and process developments of last year are primarily of interest from the technological and pollution control points of view; their economic impact on the sulphur and sulphuric acid industries is small.

The trend toward getting more acid from refinery gases continues in the Los Angeles area. General Chemical now takes H_2S from Union Oil and converts it into acid. General Petroleum has joined Hancock Chemical's "sulphur center" as the fourth contributor of H_2S. Hancock recovers sulphur from this gas, sends it to local makers of acid.

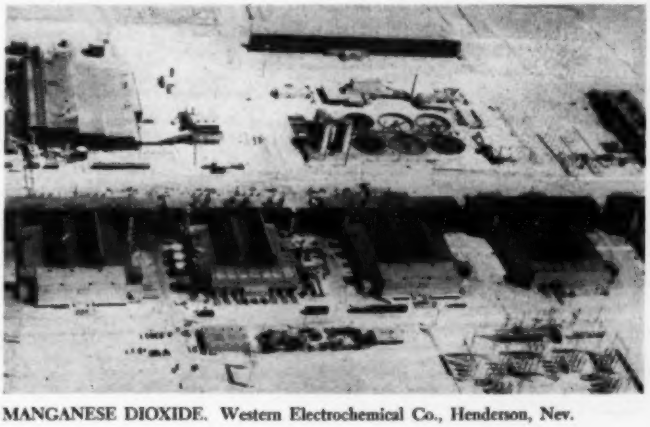
Two forward steps were taken in recovering sulphur from sour natural gas: (1) Texas Gulf completed its recovery plant in Wyoming; (2) Sid Richardson made moves to recover sulphur from West Texas gas. Potash Co. of America will make potassium sulphate from it (see Ammonia and Fertilizers).

Of the projects for increasing sulphuric acid capacity during 1950, certainly the most interesting is Chemico's new process installed at Cyanamid's Hamilton, Ohio, plant. In addition to 99 percent efficiencies (96-97 percent is normal in most contact acid plants), Chemico's process has these advantages: (1) smaller plants can be economically built and operated; (2) investment cost per ton of acid is lower, (3) cooling water needs are reduced, (4) it is simple.

Four conventional contact plants were built or started last year; capacities ranged from 100 to 300 tons of acid per day. Some $8 million were involved in sulphur mining expansions in progress during 1950.

TETRAETHYL LEAD. Ethyl Corp., Houston, Tex.

AMMONIA. Dow Chemical Co., Freeport, Tex.



MANGANESE DIOXIDE. Western Electrochemical Co., Henderson, Nev.

TO INCREASE PRODUCTION—These Projects Were Under Way in 1950...

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Alcohol				
Du Pont	Belle, W. Va		Methanol	Belle's methanol unit re-opened to help meet shortage.
Industrial Fermentation	S. W. Kansas	8,000,000	Ethanol	Proposed plant of 18,000 gpd. capacity.
Union Carbide (Carbide and Carbon)	Texas City, Tex		Methanol	Operations begun early 1950 on expanded capacity—now double Niagara Falls and S. Charleston.
Union Carbide (Carbide and Carbon)			Synthetic ethanol	Will complete unit by end of 1951.
Ammonia and Fertilizers				
American Vegetable Oil Assn	Clarksdale, Miss		Anhydrous ammonia	New 120,000 gal. plant put into operation.
Commercial Solvents	Sterlington, La	1,000,000	Nitrogen solutions	Expansion due to be completed in early 1951.
Continental Chemical	Salem, Ore		Ammonium sulphate	Leased gov't. plant. Purchases ammonia and sulphuric acid.
Dow	Freeport, Tex	5,000,000	Ammonia	100 tons per day unit now in operation for fertilizers and industrial use.
Duval Sulphur and Potash	Carlsbad, N. M	7,500,000	Potash	Construction underway on mining and refining facilities. Capacity: 730,000 tons ore per yr.
Gates Bros	Wendell, Idaho		Triple superphosphate, phosphoric acid	New facilities installed.
Gates Bros	Wendell, Idaho	750,000	Ammonium phosphate	Construction starting on new facilities.
Hooker Electrochemical	Tacoma, Wash	2,000,000	Anhydrous ammonia	Will complete early in 1952. First in Pacific N. W.
International Minerals and Chemical	Fort Worth, Tex	400,000	Chemical fertilizer	Proposed project.
International Minerals and Chemical	Polk County, Fla	4,000,000	Multiple superphosphate, etc.	Will expand plant. Also other phosphates, sulphuric acid plant.
Mathieson	Lake Charles, La		Ammonia	Increased capacity. Hydrogen piped in from adjacent plant of Southern Alkali.
Pennsalt	Montgomery, Ala		Agricultural chemicals	New plant planned.
Potash Co. of America	Dumas, Tex	750,000	Potassium sulphate	Contract awarded. Plant will convert KCl to K_2SO_4 by Hargreaves process.
Potash Co. of America	Carlsbad, N. M	1,000,000	Potassium sulphate	Planned.
Shell Chemical	West Coast		Ammonia	Again expanding capacity.
Southwest Potash	Carlsbad, N. M	10,000,000	Potash	Southwest's first shaft. In production late 1952. Initial capacity: 185,000 tons per yr.
Spencer Chemical	Henderson, Ky	6,000,000	Ammonia	In production. Capacity: 6,000 tons per mo.
Spencer Chemical	Charlestown, Ind		Ammoniating solutions	Starting operations. Using nitric acid facilities leased from gov't.
Spencer Chemical	Galena, Kans		Ammonium nitrate	Proposed.
Stauffer	Tacoma, Wash		Superphosphate	New plant of 35,000 tons per year put into operation.
U. S. Gov't	Morgantown, W. Va		Ammonia	Dismantling halted. May resume operations.
Building Materials				
Calaveras Cement	San Andreas, Calif	2,500,000	Cement	Increased capacity to 2.5 million bbl. per yr.
General Portland Cement	Dallas, Tex	500,000	Cement	Contract awarded for new facilities.
Halliburton Portland Cement	Corpus Christi, Tex	10,000,000	Cement	New plant put into operation.
Ideal Cement	Ada, Okla	1,000,000	Cement	Proposed expansion will increase capacity from 1.6 to 2.75 million bbls. per day.
Lone Star Cement	Roanoke, Va	6,000,000	Cement	Contract awarded for plant of 1,800,000 bbl. annual capacity.
Marquette Cement	Brandon, Miss	3,000,000	Cement	Contract awarded.
Perlite Mfg	Carnegie, Pa	100,000	Popped perlite	Expansion and modernization. New capacity—2 tons per hr.
Perlite Products	Dallas, Tex		Permalite	Facilities planned for this lightweight plaster aggregate.
Permanente Cement	San Jose, Calif	3,500,000	Cement	Installing fifth kiln. Will increase capacity 25%.
Riverside Cement	Oro Grande, Calif	1,000,000	Cement	Raw grinding expansion completed. Increased capacity to 3.2 million bbl. per yr.
Smithwick Concrete Products	Portland, Ore		Expanded shale	200 cu. yd. per day plant now in operation.
U. S. Gypsum	Fort Dodge, Ia	1,000,000		Additions to plant planned.
U. S. Gypsum	Sweetwater, Tex	1,000,000	Wallboard, lath, sheathing	Expansion completed.
Virginia Perlite	Hopewell, Va		Permalite	Plant planned for this lightweight plaster aggregate.
Chlorine and Caustic				
Diamond Alkali			Chlorine, caustic	Increasing capacity to meet Shell Chemical's glycerine expansion.
Dow	Pittsburg, Calif	1,500,000	Chlorine, caustic, anhydrous ammonia	25–30% expansion planned.
Hooker Electrochemical	Tacoma, Wash	3,000,000	Chlorine, caustic	Installed new type cells, doubling capacity.
Julius Hyman	Denver, Colo		Chlorine, caustic	Gov't. contract. Reactivated for limited production.
Mathieson Hydrocarbon Chemical	Saltville, Va	6,000,000	Chlorine, caustic	Under construction. Mercury cell process. In operation during 1951.
Monsanto	Monsanto, Ill		Chlorine, caustic	Completing installation of 24,000 amp. De Nora mercury-type cell. 1600 lb. Cl_2 and 1800 lb. NaOH per day.
Niagara Alkali	Niagara Falls, N. Y		Chlorine, caustic	Expansion under way.
Pennsalt	Portland, Ore	1,000,000	Chlorine, caustic	Expansion under way.
Southern Alkali	Lake Charles, La	3,200,000	Chlorine, caustic	Expansion under way.
Stauffer	Henderson, Nev		Chlorine, caustic	Fourth line of caustic cells now in operation.
Stauffer	Niagara Falls, N. Y		Chlorine, caustic	Expanding. Will double capacity.
Ethylene				
Dow	Freeport, Tex	20,000,000	Ethylene, chlorine, styrene, glycols, vinyl chloride, vinylidene chloride	Construction is underway on a 10% increase for Texas Division
Dow	Midland, Mich		Ethylene	New unit using hypersorption planned.
Du Pont	Port Arthur, Tex		Ethylene	May install facilities to supply polyethylene plant at Sabine Works.
Tennessee Eastman	Longview, Tex		Ethylene	Contract awarded for oil-absorption plant.

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Explosives				
Commercial Solvents	Agnew, Calif		Pentaerythritol	Completed plant now in operation.
Heyden	Garfield, N. J		Pentaerythritol	Planned expansion to be completed end of 1951.
U. S. Gov't (Longhorn Ordnance Wks.)	Karnack, Tex		TNT	Being readied for operation.
Hydrocarbons From Natural Gas				
Allentown-Bethlehem Gas	Bethlehem, Pa	850,000	Reformed hydrocarbons	Contract awarded.
Delta Chemical	Pointe a la Hache, La	30,000,000	Hydrocarbons	Will build. Low temp. absorption of ethane, propane and conversion to ethylene, etc.
Mathieson Hydrocarbon Chemical	Bradenburg, Ky	25,000,000	Ethylene oxide, glycol, hydrocarbons	To operate July, 1951.
Tennessee Gas Transmission	Western Ky	12,000,000	Liquid hydrocarbons	To operate in conjunction with Mathieson Hydrocarbon.
Insecticides				
Arkansas Fertilizer	N. Little Rock, Ark		Insecticides and fungicides	Operations begun—40 products.
Chipman Chemical	Pasadena, Tex	250,000	Insecticides, weed killers	Increased capacity 50%.
Coahoma Chemical	Clarksdale, Miss		Insecticides	Went into operation.
Columbia Chemicals Div			Benzene hexachloride	Increased production facilities planned.
Commercial Solvents	Terre Haute, Ind	500,000	Lindane (Ben-hex isomer)	Plan facilities for Lindane and expansion of benzene hexachloride facilities.
Hercules	Hattiesburg, Miss	1,500,000	Toxaphene	Starting construction.
Mathieson	Houston, Tex		Insecticides	Production started.
Mathieson	Little Rock, Ark		Insecticides	Production started.
Pennsalt	Montgomery, Ala		Insecticides	New plant opened.
Stauffer	Houston, Tex	1,500,000	Insecticides	Scheduled complete end of 1950.
Union Carbide (Carbide and Carbon)	S. Charleston, W. Va		Allethrin	First commercial production started recently.
Metals				
Alcoa	Point Lavaca, Tex	15,000,000	Aluminum	2 pot lines will be added.
Amco Magnesium	Wingdale, N. Y		Magnesium	Gov't. contract. To be reactivated.
American Smelting & Refining	Garfield, Utah	3,500,000	Electrolytic copper	Completed refinery for 5,500 tons of blister per mo
Combined Metals Reduction	Henderson, Nev		Pb, PbO, ZnO, MnO_2	To begin construction in 1951. To handle 330 tons per day of concentrate.
Electrometallurgical Co. or Pacific Northwest Alloys	Mead, Wash		Magnesium	Gov't. contract. Every prospect of reopening.
Harvey Machine	Near Hungry Horse Dam, Mont.		Aluminum	Planned. Completion 1952. 72,000 tons per yr.
Kaiser Aluminum & Chemical	Spokane, Wash	3,700,000	Aluminum	Contract awarded for 7th line. 40 million lb. per yr.
Kaiser Aluminum & Chemical	Manteca, Calif		Magnesium	Gov't. contract. Every prospect of reopening with Kaiser operating.
Kennecott Copper	Garfield, Utah	16,000,000	Electrolytic copper	Scheduled complete. Capacity: 12,000 tons blister per mo.
Keokuk Electro-Metals	Rock Island, Wash	1,500,000	Ferrosilicon	Plant re-designed, again in operation for magnesium production.
Lithium Corp. (Metalloy Corp.)	Minneapolis, Minn		Lithium and compounds	Expansion program completed.
New England Lime	Canaan, Conn		Magnesium	Gov't contract. To be reactivated.
Union Carbide (Electro-Metallurgical)	Sault Ste. Marie, Mich		Electrolytic chromium	New facilities to be completed in spring 1951. New process, higher purity.
U. S. Gov't (Bureau of Mines)			Zirconium	Production expanded to 1200 lb. per week.
Oil From Oilseeds				
A. E. Staley	Decatur, Ill	5,000,000	Soybean oil	New 800 ton per day soybean solvent extraction plant completed.
A. E. Staley	Painesville, Ohio		Soybean oil	Replacing expeller with solvent unit.
Borden	Waterloo, Iowa		Soybean oil	New plant started up early 1950.
Conway Oil	Denison, Tex	1,300,000	Edible oils	Proposed.
Glidden	Indianapolis, Ind	3,500,000	Soybean oil	New 250-ton plant opened early 1950.
Pacific Vegetable Oil	San Francisco, Calif		Sesame oil	Doubled capacity. plant completed.
Ralston-Purina	Bloomington, Ill		Soybean oil	New plant now in operation. Capacity: 200 tons per day.
Ralston-Purina	Iowa Falls, Iowa		Soybean oil	New plant now in operation. Capacity: 200 tons per day.
Southland Cotton Oil Mill	Waxahachie, Tex	125,000	Cotton oil	Contract awarded.
Tacoma Vegetable Oils	Tacoma, Wash	500,000	Copra oil	New plant in operation with three expellers. Capacity: 100 tons per day.
Western Solvents	Longmont, Colo		Safflower oil	Facilities put into operation early 1950.
Phosphorus				
Columbia Electro-Chemical Phosphate	Cascade Locks, Ore		Phosphorus, triple superphosphate	3,000 tons annually of phosphorus proposed. Project stalled by lack of finances.
Monsanto	Monsanto, Tenn		Phosphorus	Sixth furnace (25,000 kw.) planned with large increase in production.
Monsanto	St. Louis, Mo	1,000,000	Sodium phosphates	Construction started.
Victor Chemical	Butte, Mont	5,000,000	Phosphorus	Under construction. New furnace.
Virginia-Carolina	Charleston, S. C		Phosphorus	New furnace completed in spring 1950.
Westvaco	Lawrence, Kan		Phosphates	Facilities being installed. Operation: spring, 1951.
Westvaco	Pocatello, Idaho	5,000,000	Phosphorus	New furnace being installed. Will operate late spring, 1951.
Pigments and Dyes				
Acheson Colloids	Port Huron, Mich		Dispersed pigments	Expanding production facilities.
American Cyanamid	Willow Island, W. Va		Chrome yellow	Put into operation.
American Cyanamid	Bound Brook, N. J		Authraquinone	Expanding facilities.
Columbia Chemicals Div	Barberton, Ohio		Rubber pigments	Expanding production facilities.
Glidden	Baltimore, Md	2,500,000	Titanium dioxide	Upping capacity to 15,000 tons per year.

(Pigments and Dyes continued on p. 124)

TO INCREASE PRODUCTION, cont. . . .

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Pigments and Dyes (cont.)				
Los Angeles Chemical	South Gate, Calif.	....	Ceramic colors	First western firm to make complete range now in operation.
National Lead	Sayreville, N. J.	....	Titanium dioxide	Expanding production by 60–70,000 tons per yr.
National Lead	St. Louis, Mo.	....	Titanium dioxide	
Tennessee Eastman	Kingsport, Tenn.	....	Vat dyes	Jade green unit in operation, others to follow.
Pulp and Paper				
American Box Board	Grand Rapids, Mich.	1,000,000	Paper	Proposed.
Champion Paper & Fibre	Pasadena, Calif.	....	Paper	Three new paper machines installed.
Columbine Development	Rifle, Colo.	20,000,000	Newsprint	Under construction.
Coosa River Newsprint	Childersburg, Ala.	32,000,000	Newsprint	In operation 3 months ahead of schedule.
Crown-Zellerbach	Camas, Wash.	400,000	Wood pulp	Will install new chip handling equipment, increasing production.
Everett Pulp & Paper	Everett, Wash.	....	Paper	New paper machine planned to increase capacity to 50,000 tons per yr.
Fibreboard Products	Antioch, Calif.	....	Kraft pulp	First kraft pulp mill in California put into operation. Capacity: 250 tons per day.
Hudson Pulp & Paper	Palatka, Fla.	10,000,000	Paper	Contract awarded for addition to plant.
International Paper	Natchez, Miss.	....	Dissolving pulps	New plant put into operation. Uses hardwood and sulphate process. 100,000 ton annually.
Longview Fibre	Longview, Wash.	250,000	Paper	New wood preparation section completed to handle 8-ft. logs.
Pacific Coast Paper Mills	Bellingham, Wash.	800,000	Paper	Expansion program completed.
Potlatch Forests	Lewiston, Idaho	2,000,000	Sulphate pulp and paper	Under construction. Will turn out between 150 and 250 tons per day of paper.
Puget Sound Pulp & Timber	Bellingham, Wash.	1,300,000	Pulps	Increasing capacity. Full range of pulps to be made possible.
Riegel Paper	Acme, N. C.	13,500,000	Pulp	Contract awarded.
St. Regis Paper	Jacksonville, Fla.	10,000,000	Kraft pulp and paper	Contract awarded.
Union Bag & Paper	Savannah, Ga.	1,500,000	Paper	Proposed addition.
Weyerhaeuser Timber	Longview, Wash.	....	Kraft pulp	Installation of new equipment to start in summer 1951. Will up output 175%.
Resins and Plastics				
B. F. Goodrich Chemical	Avon Lake, Ohio	....	Vinyl resins	Expanding production facilities.
Catalin Corp.	Calumet City, Ill.	....	Liquid resins	Will add 2 kettles to recently completed plant.
Devoe & Raynolds	Louisville, Ky.	....	Alkyd resins	Will soon install unit.
Dow	New London, Conn.	2,000,000	Polystyrene	Planned.
Dow	Midland, Mich.	500,000	Styron	Addition to plastics bldg. planned.
Dow	Midland, Mich.	....	Methylcellulose	Plan to increase capacity by 1/3.
Du Pont	Parkersburg, W. Va.	....	Teflon	Another unit of this new plant completed.
Du Pont	Sabine Works, Tex.	....	Polyethylene	Facilities planned.
General Electric	Taunton, Mass.	1,000,000	Plastics	Expansion and modernization under way. Gov't. contract. Increasing production.
General Paint	San Francisco, Calif.	250,000	Alkyd resins	Facilities put into operation for 3,000 gpd. minimum.
General Tire & Rubber	Jeannette, Pa.	....	Vinyl film	New facilities in operation. Will expand further.
Goodyear Tire & Rubber	Niagara Falls, N. Y.	2,500,000	Vinyl resins	Quadruple expansion. Will make Goodyear among largest producers.
Libbey-Owens-Ford (Plaskon)	Toledo, Ohio	....	Alkyd molding compounds	New facilities under construction. Operate March 1951.
Loven Chemical	Newhall, Calif.	....	Phenolic molding compounds	400,000 lb. per mo. plant put into operation.
Monsanto	Long Beach, Calif.	....	Polystyrene molding compound	Plant put into operation—first on west coast
Neville	Los Angeles, Calif.	....	Resins and paint components	New plant planned.
Newport Industries	Oakdale, La.	500,000	Chemically-treated pale resin	Project completed.
Reichhold Chemicals	Argo, Ill.	....	Resins, pigments	Contract awarded for chemical plant.
St. Regis Paper (Panelyte Div.)	Kalamazoo, Mich.	5,000,000	Plastics	New plant started up, increasing division's capacity 50%.
Shell Chemical	Houston, Tex.	....	Surface-coating resins	New type resins made from epichlorhydrin, acetone, and phenol are now in production.
U. S. Rubber	Chicago, Ill.	....	Butadiene-acrylo-styrene and ureaformaldehyde copolymers	Increased production.
U. S. Rubber	Painesville, Ohio	....	Vinyl resins	Expansion planned to double capacity.
Union Carbide (Carbide and Carbon)	S. Charleston, W. Va.	....	Vinyl resins	Facilities to be running by mid-1951.
Union Carbide (Bakelite)	S. Charleston, W. Va.	....	Polyethylene	Will build new plant, to be completed in fall, 1951. Will double capacity.
Rubber				
B. F. Goodrich	Akron, Ohio	....	Reclaim rubber	Plant reopened.
Continental Carbon	....	....	Carbon black	Four-fold production increase planned.
Continental Oil Black	Lake Charles, La.	1,800,000	Carbon black	Complete early in 1951—5 million lb. per yr.
Dow	Freeport, Tex.	....	Expanded latex	New unit in production.
Dow	Midland, Mich.	....	Expanded latex	New unit in production.
Dow	Los Angeles, Calif.	....	Styrene	Gov't. contract. Plan to increase output for synthetic rubber from 7.2 to 9.0 million lb. per mo.
Du Pont	Louisville, Ky.	....	Neoprene	Undergoing expansion to raise production substantially.
Godfrey L. Cabot	Big Spring, Tex.	....	Carbon black	Plant to be built.
J. M. Huber	Bayton, Tex.	1,500,000	Carbon black	Contract awarded for 30 million lb. per yr. plant. Source: oil.
Phillips Chemical	Borger, Tex.	3,500,000	Carbon black	Construction to begin soon.
U. S. Gov't.	Various	....	GR-S rubber	All copolymer plants will soon be reactivated.
U. S. Gov't.	Various	....	Butadiene	All butadiene plants will soon be reactivated.

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Sulphur and Sulphuric Acid				
Allied Chemical & Dye (General Chemical)	El Segundo, Calif		Sulphuric acid	Plant to take H_2S from Union Oil Co. and convert to the acid.
American Cyanamid	Hamilton, Ohio	450,000	Sulphuric acid	Chemico's new contact process in operation.
American Smelting and Refining	Tacoma, Wash		Sulphuric acid	Increased production by 100 tons per day.
Hancock Chemical	Los Angeles, Calif		Sulphur	50 tons per day from General Petroleum's waste gas doubles capacity.
Jefferson Lake Sulphur	Lake Charles, La	850,000	Sulphur	Contract awarded for additional mining facilities.
Jefferson Lake Sulphur	Orange, Tex	2,500,000	Sulphur	Sulphur mining plant under construction.
Jefferson Lake Sulphur	Calcasieu Parish, La		Sulphur	Contract awarded for sulphur mining facilities. 500 tons per day.
Jefferson Lake Sulphur	Starks, La	2,500,000	Sulphur	New mining facilities completed.
National Lead	Sayreville, N. J		Sulphuric acid	Contract awarded for 300 ton per day plant. For titanium dioxide production.
National Lead	St. Louis, Mo		Sulphuric acid	Contract awarded for 300 ton per day plant. For titanium dioxide production.
Sid Richardson	West Texas		Sulphur	Will recover sulphur from natural gas and send to Potash Co. of America.
Stauffer	Southern California		Sulphuric acid	Start construction soon on 200 ton per day plant.
Texas Gulf Sulphur	Spindletop, Tex	2,000,000	Sulphur	Sulphur mining plant under construction.
Texas Gulf Sulphur	Worland, Wyo		Sulphur	Plant put into operation early 1950. Source: natural gas.
Synthetic Fibers				
American Cyanamid	Virginia		Acrylonitrile	Considering a Virginia site for new plant.
American Enka	Enka, N. C., Lowland, Tenn.	8,750,000	Rayon	Plan increased production facilities.
Barium Reduction	S. Charleston, W. Va		Carbon bisulphide	New Pure Oil process in operation (from sulphur vapor and methane).
Celanese	Rock Hill, S. C		Acetate staple fiber	New facilities for staple fiber to be installed—filament fiber only at present.
Chemstrand	Decatur, Ala	5,000,000	Chemstrand	Under construction—new synthetic fiber.
Du Pont	Camden, S. C		Orlon	Plant dedicated. New acrylic fiber (continuous filament).
Du Pont	Camden, S. C	20,000,000	Orlon	New unit planned already—for staple fiber.
Du Pont	Kinston, N. C	24,000,000	Fiber V	Contract awarded for this new fiber plant.
Du Pont	Seaford, Del		Nylon yarn	Being expanded, complete early 1951.
Du Pont	Chattanooga, Tenn	1,500,000	Nylon yarn	Being expanded, complete early 1951.
Du Pont	Martinsville, Va		Nylon yarn	Expansion program announced.
Du Pont	Victoria, Tex		Nylon intermediates	Plant due to be completed soon.
Du Pont	Niagara Falls, N. Y		Nylon intermediates	Expanding capacity.
Industrial Rayon	Painesville, Ohio		Tire rayon	Upped to 88 million lb. per yr.
Monsanto	Texas City, Tex	30,000,000	Acrylonitrile	Starting construction. Source: acetylene.
Stauffer	Lowland, Tenn	1,000,000	Carbon bisulphide	Scheduled complete end of 1950. Will supply American Enka's mill nearby.
Union Carbide (Carbide and Carbon)	Institute, W. Va		Acrylonitrile	Scheduled for completion end of 1950. Will be a supply for Orlon and dynel.
Union Carbide (Carbide and Carbon)	Texas City, Tex	7,500,000	Acrylonitrile	Proposed.
Virginia-Carolina	Taftville, Conn		Vicara	Planned expansion necessitated by increased demand
Others				
Air Reduction (Pure Carbonic)	Kansas City, Kan	1,000,000		Contract awarded for new facilities.
Allied Chemical & Dye (Solvay Process Div.)	Syracuse, N. Y	20,000,000	Soda ash, related products	Postwar expansion project. Some units (e.g. chlorinated benzenes) completed.
Allied Chemical & Dye	Kennewick, Wash		Chemicals for Hanford	Start construction in Nov. 1950.
American Cyanamid	Michigan City, Ind	3,000,000	Cracking catalysts	Plan to increase production 50% to 3,000 tons per mo.
American Cyanamid	Fort Worth, Tex		Cracking catalysts	Expansion under way.
Atlas Powder	Wilmington, Del		Sorbitol	Increased capacity 50%. Equal additional increase slated.
Barium and Chemicals	Willoughby, Ohio			Gov't. contract. Going full blast.
Carthage Hydrocol	Brownsville, Tex	50,000,000	Synthetic organics	Completing construction.
Celanese	Chemcel, Tex		Paraformaldehyde	Construction to start in fall, 1950.
Commercial Solvents	Terre Haute, Ind	670,000	Bacitracin	Completing construction.
Continental Chemical	Salem, Ore		Manganese dioxide (battery grade)	Operations started—for Signal Corps. 200 tons per mo.
Darco	Marshall, Tex		Activated carbon	Expanding to increase output 50%.
Diamond Alkali	Cincinnati, Ohio	300,000	Sodium silicate, related products	Put into operation a third 50,000 ton furnace.
Dow	Pittsburg, Calif	1,000,000	Synthetic methionine	2,000 lb. per day plant put into operation.
Du Pont	Deepwater Point, N. J		Tetraethyl lead	New units to up capacity by ½ near completion.
Du Pont	Niagara Falls, N. Y		Polyvinyl alcohol, vinyl acetate	Increased capacity for polyvinyl alcohol. Plan to begin production of vinyl acetate.
Du Pont	Memphis, Tenn	7,500,000	Sodium cyanide	Construction to start soon on newly-purchased site. Other products to follow.
Ethyl	Houston, Tex	20,000,000	Antiknock compounds	Construction starting on facilities for intermediates.
Ethyl	Baton Rouge, La		Antiknock compounds	Expansion under way.
Filtrol	Salt Lake City, Utah	3,000,000	Cracking catalysts	Plant nearing completion. To convert clays into sulphur-resistant catalysts.
G. D. Searle	Skokie, Ill	750,000	Pharmaceuticals	Construction under way.
Glidden (Soya Prod. Div.)	Chicago, Ill		Cortisone	Production from bile announced.
Halby Chemical	Wilmington, Del		Thioglycolic acid and salts	Finishing construction. Initially 1 ton per day of ammonium thioglycolate (cosmetic grade).
Hancock Chemical	Los Angeles, Calif	3,000,000	Ethylene glycol	First West Coast plant planned. Capacity: 60,000 lb. per day.
Harbison-Walker	Windham, Ohio		Silica refractories	Plant having capacity of 20 million 9-in. brick equivalents per yr. will be built.
Hardesty Chemical	Dover, Ohio	250,000	Plasticizers	Expansion program finished.
Hoffmann-La Roche	Nutley, N. J		Synthetic Vitamin A	New plant reached full-scale production early 1950.
Hooker-Detrex	Ashtabula, Ohio		Trichlorethylene	New plant completed.

(Other projects continued on p. 126)

TO INCREASE PRODUCTION, cont. . . .

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Others (cont.)				
International Minerals & Chemical	San Jose, Calif	130,000	Monosodium glutamate	Increasing capacity.
Jefferson Chemical	Port Neches, Tex		Mono, di, and triethanolamine	Under construction. Will provide base for additional plastics and detergents.
Kaiser Aluminum & Chemical	Moss Landing, Calif		Magnesite, dead-burned dolomite	Second kiln, 250 ft. long, under construction.
Koppers	Kearny, N. J.		Hydrogen cyanide	Ready for operation. From coke oven gases. Replaces blown-up plant.
Leslie Salt	Redwood City, Calif		Crude salt	Expansion program to raise production to over 800,000 tons per yr. Finish late in 1951.
Lever Bros	Los Angeles, Calif	25,000,000	Detergents and edible prod.	Completing construction. Operate early Feb.
Merck	Danville, Pa	Several million	Antibiotics and fine chemicals	Under construction. Large fermentation unit included.
Michigan Chemical	St. Louis, Mich		NaCl, $CaCl_2$, $MgCl_2$	New salt evaporators for brines installed.
Miles Laboratories (Sumner Chem. Co.)	Zeeland, Mich		Pharmaceuticals	Increased production 30%.
Miles Laboratories (Sumner Chem. Co.)	Elkhart, Ind		Citric acid	Under construction. To use submerged fermentation.
Morton Salt	Grand Saline, Tex		Salt	Extensive expansion completed.
National Carbide	Louisville, Ky	10,000,000	Calcium carbide	Proposed facilities would furnish source of acetylene for Du Pont's neoprene expansion.
National Distillers	Ashtabula, Ohio	10,000,000	Sodium, chlorine	Put into operation.
Nopco Chemical	Richmond, Calif		Palmitates, stearates, etc.	In production spring, 1951.
Olin Industries	Pisgah Forest, N. C	20,000,000	Cellophane	Starting construction. Du Pont process.
Oronite	Richmond, Calif		Paraxylene	Tonnage quantities. Scheduled for operation during 1950.
Pennsalt	Calvert City, Ky	250,000	Laundry sours	Put into production.
Pittsburgh Coke & Chemical	Neville Island, Pa		Plasticizers	Unit put into operation.
Pontiac Refining & Chicago Corp	Corpus Christi, Tex	15,000,000	Glycol, ethylene oxide, butadiene, gasoline	Planned. Butadiene for Du Pont's Victoria, Tex nylon salt plant.
Quaker Oats	Omaha, Neb		Furfural	Under construction. To supply Du Pont's new adiponitrile plant with 40 million lb. per yr.
Reichhold Chemicals	Ferndale, Mich	1,000,000		Contract awarded for chemical plant.
Reilly Tar and Chemical	Daingerfield, Tex	800,000	Coal tar byproducts	Planned. Next to Lone Star Steel Co.'s coke plant.
Shell Chemical	Deer Park, Tex		Synthetic glycerine	Promised. Will get chlorine from Diamond's increased output.
Shell Oil	Wilmington, Calif		Synthetic benzene	In full scale production.
Tennessee Copper	Copperhill, Tenn		Liquid sulphur dioxide	Scheduled for operation early this year—25 tons per day.
Tennessee Eastman	Longview, Tex		Acetylene	Plan to make from methane.
U. S. Gov't	Amarillo, Tex		Helium	Reopening announced to meet increased defense and industrial demands.
Union Carbide (Carbide and Carbon)	Whiting, Ind		Ethylene glycol	New facilities in operation.
Union Carbide (Carbide and Carbon)	Institute, W. Va		Ethylene glycol	Some units in operation. Further expansion is under way.
Union Carbide (Carbide and Carbon)	S. Charleston, W. Va		Acrylic esters	Commercial production was scheduled for 1950.
Union Carbide (Carbide and Carbon)			Diisopropyl amine	Production increased. Available in tank car or compartment car lots.
Union Carbide (National Carbon)	Columbia, Tenn	5,000,000	Electrodes	Considering addition—pending power arrangements with TVA.
Utah-Idaho Sugar	Idaho Falls, Idaho	250,000	Beet sugar waste	Under construction. Facilities to concentrate Steffen waste. Send to monosodium glutamate plant.
Western Electrochemical	Henderson, Nev	Several million	Chlorates, perchlorates	Will increase production by spring 1951 for fuel components and projectiles.
Western Electrochemical	Henderson, Nev		Manganese dioxide	Will begin production in Feb. for Signal Corp. and battery manufacturers.

CAUSTIC & CHLORINE

On a Secure Throne

The chlorine-caustic industry is on the move again. Reason: cries for more of these chemicals (chlorine is still preferred) by practically the gamut of industrial users. Some of the big "growth users" are petroleum refiners; manufacturers of synthetic detergents, industrial solvents and organic chemicals; the pulp and paper industry. Diamond Alkali, for example, is upping its output so Shell Chemical can turn out more synthetic glycerine.

Mercury cells are now in the limelight. Mathieson Chemical is putting in a large installation of its own mercury cells at its $6 million project in Virginia. Monsanto put in at its Monsanto, Ill., plant the first Italian De Nora cells on the North American continent to produce chlorine and rayon-grade caustic at any concentration up to 73 percent. Two other De Nora cell units are now under construction in pulp mills—one in Canada and one in North Carolina. The French Krebs cells at Dominion Alkali in Canada have been operating for over a year.

PULP & PAPER

For the Records

More than $120 million was committed during 1950 for various capacity-increasing projects by pulp and paper firms.

International Paper. New mill at Natchez, Miss, which recently went on stream, will alone raise the continent's dissolving pulp capacity by some 13 percent. It's the first dissolving plant in the South to use the kraft process on hardwoods.

Coosa River. $32 million, 100,000-ton mill went into production at Childersburg, Ala., early in 1950 three months ahead of schedule.

Columbine Development Co. Announced its plans to make 60,000 tons of newsprint annually in a new $20 million mill in the vicinity of Rifle, Ohio.

Other large operations are under way in the South and West (see table). A peace-plus-war economy will certainly need more pulp, paper and paper products.

AMMONIA & FERTILIZERS

Peace Still Reigns

Most ammonia projects under way last year were planned for peacetime fertilizer and industrial uses. War and preparations for war hadn't really hit the ammonia industry. Only sign of things to come in the ammonia-nitric acid-high explosives field: the half-dismantled government ammonia plant at Morgantown, W. Va., may soon be reactivated. Its capacity is 18,700 tons a month.

Hooker Electrochemical plans to add something new to the Pacific Northwest: an anhydrous ammonia unit at Tacoma that will use by-product hydrogen from the firm's chlorine cells. Pulp and paper mills of the area are expected to use the product in their planned ammonia pulping processes.

Output from the Shell, Dow and Mathieson ammonia projects will presumably go to both agriculture and industry. Mathieson will get its hydrogen from the adjacent plant of Southern Alkali.

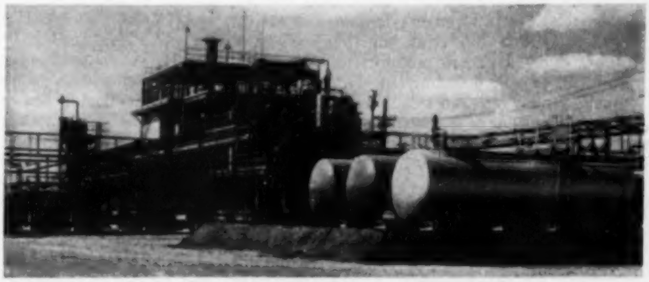
Stauffer put into operation at Tacoma a new superphosphate unit with a capacity of 35,000 tons annually. The triple superphosphate plant of Gates Bros. at Wendell, Idaho, is now operating smoothly. This unit has a submerged combustion concentrator for phosphoric acid. Triple superphosphate operations in Florida are planned by International Minerals and Chemical; Western Fertilizer Assn. is reported to plan on a unit to make 100,000 tons annually.

In the potash business, revival of the Hargreaves process—modified, of course—made news. Potash Co. of America plans to react potash with SO_2, air and steam to make potassium sulphate at two plant locations in New Mexico and Texas.

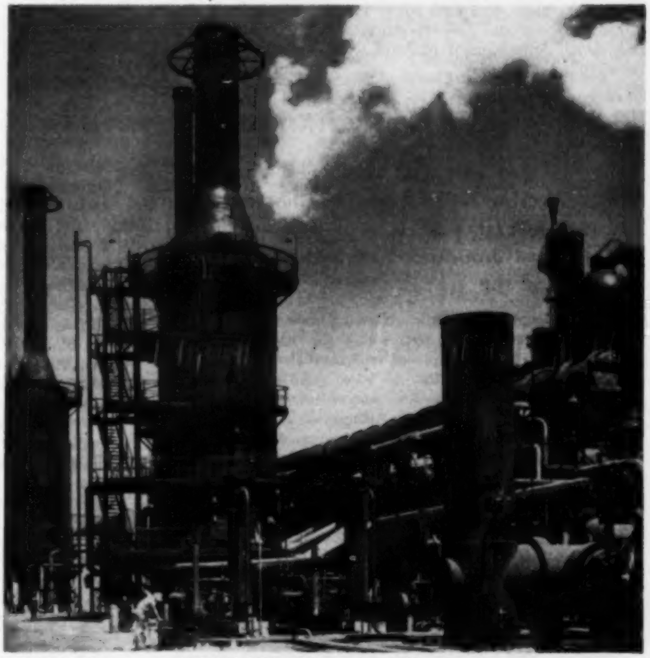
PIGMENTS

Watch Titania

Titanium dioxide dominated developments in the pigments field. First of the five electric arc furnaces in the province of Quebec started turning out slag with 70 percent TiO_2. The slag will be shipped to titanium pigment producers in the United States. Maybe later some of it will be used to turn out titanium metal.



SYNTHETIC METHIONINE. Dow Chemical Co., Pittsburg, Calif.



BUTADIENE. Standard Oil (Calif.), El Segundo, Calif.

FERROSILICON. Keokuk Electro-Metals, Rock Island, Wash.

When this Quebec Iron & Titanium Corp. plant hits full stride in the summer of 1952, it can produce the equivalent of 190,000 tons of TiO_2 annually (about one and a half times the present output of National Lead's mine in New York state). QI&T is jointly owned by Kennecott Copper and New Jersey Zinc.

Atop this put National Lead's program at two plants that will increase TiO_2 capacity by close to 70,000 tons annually. This additional tonnage is earmarked for growing needs of the industrial mobilization program.

Glidden plans to spend some $2.5 million to up its TiO_2 capacity at Baltimore. Approximate increase will be 15,000 tons a year.

METALS

Mostly Light

The defense program has had a heavy impact on the light metals field. Two government-owned magnesium plants—at Mead, Wash., and Manteca, Calif.—are scheduled to be reopened soon. Both used the ferrosilicon process during World War II.

More aluminum capacity is in the works for Alcoa's plant at Point Lavaca, Tex., and for Kaiser's plant at Spokane, Wash. Biggest news, in a way, is the entry of Harvey Machine Co. into the aluminum field; now there's four in it. Harvey's reduction plant will be located near Hungry Horse dam, in Montana. When completed in 1952, it will turn out 72,000 tons a year. Harvey may put up a new Bayer aluminum plant at Portland, Ore.

Union Carbide has developed a new process for making high-purity electrolytic chromium. Plant site will be Sault Ste. Marie, Mich.

Three concerns in this country—Titanium Metals Corp., Metal Hydrides and Rem-Cru Titanium Corp.—are making limited quantities of titanium metal from domestic ores. Let's hope that within a few years we'll be able to announce a major expansion in this light metal field. Titanium is a metal for the chemical industries to watch.

FOR HIGHER PRODUCTIVITY—These Processes Were Developed Last Year . . .

For new and improved processes and processing techniques, 1950 was a rich harvest year. Here are a few—but only a few—that were announced or put into operation during the year.

Benzene. A modified catalytic reforming process that "could become important in overcoming the nation's benzene shortage." Uses an improved type of catalyst. Announced by Atlantic Refining Co.

Manganese dioxide. Schumacher process for converting low-grade ores into battery-grade manganese dioxide, now in big demand. To be used by Western Electrochemical Co., Henderson, Nev.

Synthetic rubber. Improved technique and new materials that might increase output of present GR-S plants 20 percent or more. Announced by General Tire & Rubber Co.

Bleached pulp. Cold steep bleaching technique, using hydrogen peroxide, that allows small operators to bleach pulp sheets at high efficiency, low cost. Developed by Buffalo Electro-Chemical Co., used by several pulp operators.

Epon resins. An entirely new class of versatile resins; raw materials are acetone, epichlorhydrin and phenol. Developed by Shell Chemical and Devoe & Raynolds; commercial unit at Shell Chemical, Houston.

Fatty alcohols. By high-pressure hydrogenation of vegetable fats and fatty acids, using the Italian De Nora process. In small-scale use by Procter & Gamble, Los Angeles.

Terramycin. A promising new antibiotic in crystalline form. From fermentation of *Streptomyces rimosus.* Produced by Chas. Pfizer & Co., Brooklyn.

Greases. First continuous process for making lime-base greases; ups capacity fourfold over batch methods. In operation at Esso Standard Oil, Baltimore.

Acetaldehyde. By partial dehydration of alcohol, with hydrogen as byproduct. Looks cheaper than present methods of dehydrating ethylene or of oxidizing ethyl alcohol. Announced by Columbia University.

Acrylonitrile. And related chemicals by catalytic reaction of acetylene with hydrogen cyanide. To be used in a new plant by Monsanto at Texas City.

Glacial acrylic. A promising new product made by molecular rearrangement of beta-propiolactone. In commercial production by B. F. Goodrich Chemical, Avon Lake, Ohio.

Fatty acids. Technique for separating fatty acid components of vegetable, marine and animal oils by fractional crystallization from solvents. Developed by Texaco; first commercial unit operated by Armour at McCook, Ill.

Organic silicates. A new group different chemically from the silicones. Some members remain liquid from −100 to 700 deg. F. Under investigation by Hodges Research & Development Corp. and Oronite Chemical.

Acrolein. By catalytic oxidation of propylene; cheaper than thermal cracking of diallyl ether. Can be used to convert 3-4 carbon olefins to vinyl type aldehydes or ketones. In production by Shell Development, Emeryville, Calif.

Zirconium. In ductile form, by reacting sublimed zirconium chloride with molten magnesium, then purifying. Pilot plant production under way at U. S. Bureau of Mines, Albany, Ore.

Benzene. From petroleum raw materials by catalytic isomerization of methyl pentanes to cyclohexanes and dehydrogenation of these to benzene, followed by extractive distillation. Commercial production by Shell Oil, Wilmington, Calif.

Allethrin. Essentially synthetic pyrethrins. An important 12-step process using allyl acetone, methallyl chloride and glycine. Will relieve our dependence on imported pyrethrum. Developed by U. S. Department of Agriculture; first commercialized by Carbide & Carbon, S. Charleston, W. Va.

Rice oil. From rice bran by a continuous solvent extraction technique. Developed by Allis-Chalmers; first commercial unit at American Rice Growers Corp., Houston.

Sulphuric acid. An improved contact process that gives higher conversion efficiencies at lower investment and operating costs. Developed by Chemical Construction Corp.; first commercial unit at Cyanamid's Hamilton, Ohio, works.

Octyl plasticizers. New process to make octyl phthalate, iso-octyl sebacate and iso-octyl adipate plasticizers. Commercial facilities installed by Morton-Withers Chemical, Greensboro, N. C.

Gasolines. Important development for upgrading the octane rating of straight run and natural gasolines. Platforming process represents reforming in the presence of hydrogen and platinum catalyst. Developed by Universal Oil Prod-

ucts Co.; first commercial unit at Old Dutch Refining Co. in Michigan.

Synthetic rubber. A process for making polybutadiene or styreneless rubber; product shows considerable promise for tire treads. Pilot plant production and testing by Phillips Petroleum, Bartlesville, Okla., and Office of Rubber Reserve.

Chromium. High-purity metal by an entirely new electrolytic process. U. S. Bureau of Mines and Union Carbide's Electro Metallurgical division, Sault Ste. Marie, Mich. Plant under construction.

Vegetable oils. Exsolex process, developed by V. D. Anderson Co. of Cleveland; improves yield and lowers cost of extracting cottonseed oil. Uses pre-expellers before solvent extraction. Commercial unit at Delta Products Co., Wilson, Ark.

Carbon bisulphide. By high-temperature reaction of sulphur vapors with methane in the presence of a silica gel catalyst. Byproduct H_2S is removed by selective absorption. Developed by Pure Oil, used commercially by Barium Reduction, S. Charleston.

Vitamin A. A 12-step synthesis process based on citral, formaldehyde and acetic acid as raw materials. First commercial synthesis of this important vitamin. Developed by Hoffmann-La Roche, Inc. at Nutley, N. J.; in use by Hoffmann-La Roche and two other producers.

Methionine. DL-methionine, made synthetically, from acrolein, methyl mercaptan, sodium cyanide, ammonium carbonate, caustic soda and hydrochloric acid. First commercial synthesis of this vital amino acid. Plant in operation at Dow Chemical, Pittsburg, Calif.

Titanium concentrates. A new process that will make available vast quantities of titanium raw material to titanium dioxide pigment producers. Electric arc furnaces smelt ore and produce a high TiO_2 slag. Now getting into production at Quebec Iron & Titanium Corp., Sorel, Quebec.

Acrylates. Monomeric acrylate esters—including methyl and ethyl—by a new process starting with pure olefin hydrocarbons. Commercial production by Carbide & Carbon, S. Charleston.

Para-Xylene. First commercial process to make this product in relatively pure form from petroleum raw materials. Separated by a low-temperature fractional crystallization method. Commercial production by Oronite Chemical, Richmond, Calif.

Acetylene. By thermal cracking of methane in natural gas, brought about by partial combustion of the gas with oxygen. Oppau (Sachse) process. Planned by Monsanto at Texas City.

Fiber V. Condensation polymer of ethylene glycol and terephthalic acid. First use of the process to make this acrylic fiber in the United States. Plant to be built by Du Pont at Kinston, N. C.

Potassium sulphate. Potash will be reacted with sulphur dioxide, air and steam to yield potassium sulphate. Modified Hargreaves process to be used by Potash Co. of America, Carlsbad.

Acetovanillone. A high-purity product obtained from alkaline degradation of the lignin molecule. Developed and produced by Marathon Corp., Rothschild, Wis.

Heptachlor. An insecticide made by a process based on the Diels-Alder reaction of hexachlorocyclopentadiene and cyclopentadiene. Produced by Velsicol Corp., Marshall, Ind.

Citric acid. By a deep-fermentation process. New production unit to be operated by Sumner Chemical Co., Elkhart, Ind.

Sodium cellulose sulphate. A new water-soluble product made by reacting sulphuric acid with cellulose to give cellulose acid sulphate, neutralizing with caustic soda. First commercial unit at Tennessee Eastman Corp., Kingsport, Tenn.

Pulp. First plant to turn out dissolving-grade pulp from hardwoods by the sulphate (Kraft) process. Recently put into operation by International Paper at Natchez, Miss.

Chlorine. By electrolysis of hydrochloric acid. Cupric chloride is the intermediate carrier to give chlorine and cuprous chloride, which is reoxidized with air in a hydrochloric acid solution. Advantages of new cell: low energy requirements, no coproduct caustic soda. Announced by Westvaco Chemical.

Ion Exchange. Single mixed bed of ion exchange resins in place of the conventional two-bed systems. Simplifies exchange techniques, extends possibilities into other fields. Developed by Rohm & Haas' Resinous Products Division, Philadelphia.

Fertilizers. Automatic dry mixing technique reduces operating labor, saves on raw materials, turns out a more accurate formula. Developed by Chemical Engineering Service, Green Bay, Wis.; used by several commercial plants.

Glycerine. Ion exchange technique for purifying crude glycerine eliminates distillation step, lowers investment costs, gives a high-purity product. Developed by Illinois Water Treatment Co., Rockford, Ill.; used by several producers.

Vegetable oils. New Rotocel percolation extractor has many advantages over conventional basket type for extracting oil from vegetable seeds. Developed by Blaw-Knox, Pittsburgh; used on soybeans by Soya Rich Products at Wichita and by Glidden at Indianapolis.

Tritium. Possibly by bombarding lithium with neutrons in atomic piles to convert it into this extra-heavy hydrogen isotope. Or if this does not work out the reactors may be used to make plutonium at the giant South Carolina plant that Du Pont will build for AEC.

Titanium. Powdered metal by calcium reduction of pigment-grade titanium dioxide. Pilot plant operations at Dominion Magnesium, Haley, Ont.

Acetylene. Schoch electric arc process for producing acetylene from methane in natural gas. Now available for licensing from University of Texas.

Fertilizers. Process for making fertilizer products by treating phosphate rock with nitric acid and ammonia. Shows promise of lowering costs and improving quality. Pilot plant work by TVA at Wilson Dam, Ala.

Urea. Once-through process in which the carbamate solution is not recycled. Raw materials: the usual ammonia and carbon dioxide. Operated by Solvay, South Point, Ohio.

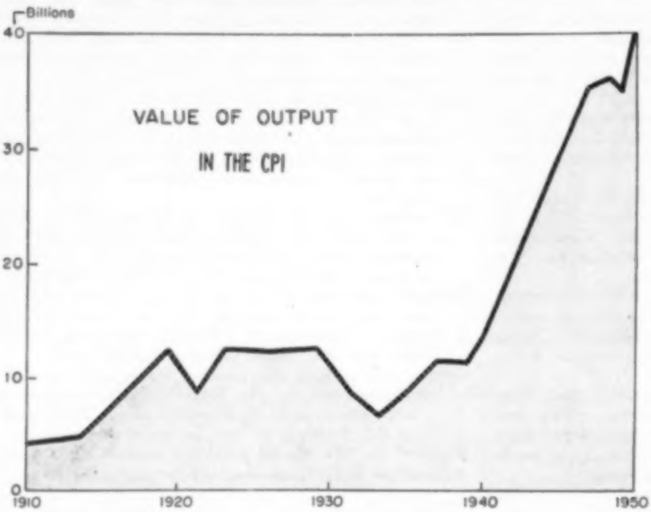
Benzene. Hydroformer unit formerly turned out toluene; now recovers natural benzene fractions and synthesizes benzene by dehydrogenation of cyclohexane. Commercial operation by Pan American Refining at Texas City.

Chlorine. By De Nora mercury cells; rated capacity 30,000 amp. Produces rayon-grade caustic. First large De Nora cell installation in North America. To be installed by Leonard Construction for Marathon Paper Mills of Canada, Marathon, Ontario.

Acetylene. By thermal cracking of natural gas using an improved regenerative process. Commercial plant to produce 1,000,000 cu. ft. a month now going on stream at Wulff Process Co. plant in Los Angeles. Developed by Wulff Process; now available for licensing.

Sulphite Liquors. Method for burning calcium-base sulphite pulping liquors without auxiliary fuel. Developed by Sulphite Pulp Manufacturers League and Babcock & Wilcox; first successful large-scale demonstration at Consolidated Water Power & Paper Co., Interlake, Wis.

SUPPLY & DEMAND



BUSINESS

Peacetime Peak

Business is at the highest level ever reached in peacetime. It is higher than at any time except at the peak effort of World War II.

Federal Reserve's index of industrial production (1935-39 = 100) now stands at about 215. The first six months of 1950 averaged 189. Gross national product—market value of all goods and services made—has climbed up to $300 billion a year compared with a rate of $266 billion in the first half of 1950.

In practically every field from basic industries to consumer goods—last year was a record-breaker.

No Let-Down

Where will business go now? Ordinarily it would take a great deal of courage to say "up," less courage to say "down"—particularly since business activity has reached these heights after a five-year climb.

But this is no ordinary year. We are trying to support a greatly enlarged defense program while civilian demand for most goods is still avid. In fact, both business and consumer demand are further stimulated by the prospect that many items will be made scarce by military needs.

The outlook can, of course, change if the present half-war explodes into an all-out atomic conflict—or if it subsides into a lasting peace. But no significant let-down in business appears possible as long as Russia continues to threaten. It is doubtful if peaceful gestures from the Kremlin would even slow down industrial mobilization. The United States has undertaken a rearmament effort which will be carried out as a safeguard against future aggression.

Rearmament will add at least $15 billion to government expenditures in 1951. Business capital expenditures are also rising (see *Plants and Processes*). Consumers are filling their pockets with the highest personal income on record. That assures high sales of consumer products. There may be important variances between product lines. But the signs add up to continued boom and inflation.

Problem of chemical process industries in 1951 is how to raise production. The combined needs of the defense effort and of civilian consumers can only be met by more output. This is particularly true in the basic industries; supplies of chemicals, metals and electric power set the limit on the output of finished goods.

It will be harder to raise output in 1951 than it was in 1950; we are pushing toward the limit of our productive resources. Most plants are already operating near capacity. Over half the capital expenditures made in 1950 were for modernizing existing facilities. And this will also be true of much capital spending in the first part of 1951. Months will pass before industry's new expansion plans take the shape of finished factories. Meanwhile, output will depend chiefly on how many plants run extra hours.

How Much?

How much can industrial production increase under these conditions? Any estimate is subject to a wide margin of error. With more plants running extra shifts, industrial production can probably be pushed from 215 on the Federal Reserve Index to 230 by June. By the year-end, it might reach 240.

An all-out war effort, with much longer working hours, could send the index still higher. Total national output will rise more slowly than industrial production, as the trade and service industries will have trouble finding more workers (see *Labor*).

Over-all increase in production will probably not be enough to avoid substantial price inflation during 1951. Incomes are rising faster under the impetus of fuller employment, overtime pay and a succession of large wage increases in basic industries. Business income too is high, with record profits piling up. Both personal and business savings are at all-time peaks. So there is enough money around to force up prices, particularly prices of those items which threaten to be in short supply.

The Great Unknown

One of the great unknowns: how far will the government let inflation go before adding to wage and price controls already authorized by Congress? It seems more than likely that by mid-year rising living costs, spiraling wages, and increasing scarcity of both materials and manpower will force application of broader controls.

Here again, everything depends on the size and speed of the military program. A rapid expansion will bring the need for controls closer; a slowdown would postpone the crisis.

Speed of the military build-up will determine (1) whether business activity continues straight up without serious interruption or (2) whether there is some temporary unsettling during the conversion from civilian to defense

production. Allocation of scarce metals and chemicals already promises to reduce activity in the consumer durables industries. Production of automobiles and electric appliances, for example, is likely to be cut by 25 percent from the 1950 rate. Residential and commercial construction are also being cut back. Unless workers in these industries are promptly absorbed by defense jobs, temporary pockets of unemployment will result. Some manufacturers will have idle capacity until they get defense contracts.

These trouble spots, however, will be the exceptions. The great basic industries will all be operating near capacity in the months ahead. The steel industry, for example, will probably continue above 100 percent of its rated capacity. Demand is equally great for non-ferrous metals, industrial chemicals, rubber, plastics, rayon, pulp and paper. Orders are booked for months ahead by manufacturers of a wide variety of finished goods. And one industry after another will gradually take up its share of the rearmament effort.

The Answer

As 1951 wears on, the number one problem will be how to get more production from plants and workers already fully employed. Management will have to make the most of improved methods and equipment.

Only higher productivity can ward off another tremendous wave of inflation. Only higher productivity can keep the fear of democracy's might always in the Russian mind.

By Popular Demand

Every major chemical-using industry measured by *Chemical Engineering's* consumption index is operating at a rate well above 1948's record levels.

Consumption of chemicals in the plastics industry has doubled since 1947 to seven times the prewar rate.

Chemicals in fertilizers have doubled since 1939; this year is up about 2 percent over the record 1948 rate. In addition to stepping up the use of fertilizers, farmers now use larger quantities of other agricultural chemicals. Pesticides and weed killers are finding ever-widening farm roles.

Recent demand for pulp and paper has raised the use of chemicals in this process industry to all-time highs. In 1950 this part of the CPI operated about 17 percent ahead of 1949.

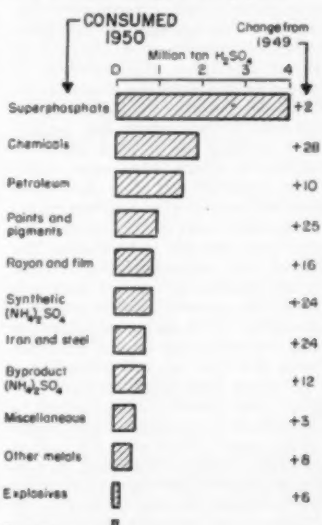
Iron and steel used almost 20 percent more chemicals this year than in 1949. Chemical consumption in this industry has reached an all-time high.

CHEMICAL ENGINEERING'S Index of Industrial Chemical Consumption

Industries	1939	1941	1943	1945	1947	1948	1949	1950 (Est.)
Fertilizers	25.11	31.49	40.12	42.73	51.15	53.30	52.49	54.17
Pulp and Paper	10.52	13.98	19.05	19.44	22.02	23.70	22.38	26.57
Glass	12.51	15.03	18.80	18.64	21.77	19.75	18.10	20.56
Petroleum	13.45	15.29	15.56	18.71	20.03	21.75	21.50	22.36
Paint, Varnish and Lacquers	10.06	15.03	15.47	17.17	23.86	24.25	21.82	26.21
Iron and Steel	8.21	12.08	13.49	11.96	12.81	13.41	12.06	14.96
Rayon	9.08	12.87	15.53	18.35	23.49	26.35	23.10	29.89
Textiles	7.89	11.06	11.43	10.30	11.07	10.83	9.23	11.05
Coal Products	7.17	9.28	9.47	9.41	10.75	10.13	9.58	10.76
Leather	4.16	4.88	4.56	4.54	4.75	4.79	4.19	4.33
Industrial Explosives	4.53	5.54	9.12	9.36	7.40	8.11	7.23	8.37
Rubber	2.79	3.91	3.80	4.95	5.95	5.34	4.76	6.02
Plastics	2.05	3.71	4.80	5.75	7.41	8.38	9.56	15.30
INDEX (1935=100)	124.15	162.89	176.73	187.67	211.86	229.40	215.94	249.80

Rayon is another customer that has jumped its demand for chemicals. Chemical consumption has climbed 28 percent above last year's demand. It is now more than 10 percent above the previous record rate.

As defense needs of the nation grow, all indicators point to an even better year for the CPI in 1951. Biggest problems facing the industry today are (1) how to evaluate expanding demands and (2) what facilities should be constructed to keep a steady flow of raw materials to processing plants.



SULPHURIC ACID

Still Not Enough

Sulphuric acid got more than its share of attention this year. Reason: everybody wanted more.

Production of our biggest and most important chemical ran pretty close to capacity in 1950. Still there wasn't enough to satisfy all needs. Biggest worry of the acid producers was that 1950 demand was largely for peacetime needs. What would happen when war industries put in their bid for a large share of the output? Next problem was where to get additional raw material to satisfy the coming demands. More acid-producing capacity is going up; it will be needed!

Where It Goes

H_2SO_4 Used in . . .	1949	1950
Fertilizers*	(Tons)	
Superphosphate	3,860,000	3,950,000
Byproduct $(NH_4)_2SO_4$	580,000	615,000
Synthetic $(NH_4)_2SO_4$	614,000	760,000
Chemicals*	1,450,000	1,960,000
Petroleum	1,360,000	1,480,000
Paints and pigments	785,000	985,000
Rayon and film	660,000	765,000
Iron and steel	500,000	620,000
Other metals	325,000	350,000
Explosives	123,000	130,000
Textiles	75,000	85,000
Miscellaneous	378,000	390,000
Total	10,700,000	12,100,000

* See text for new breakdown.

To evaluate the demand for acid, *Chemical Engineering* has prepared its usual estimates of new acid consumption. However, this year we've worked out a more detailed breakdown. Here is what the changes are and how they can be correlated with earlier data. In the past the fertilizer figure has included superphosphate, the coal products data have included ammonium sulphate from byproduct sources and the synthetic ammonium sulphate has been classed as a chemical. Otherwise this table is directly comparable with those we've published in the past.

One of the interesting developments last year was the rapid growth of acid used in making synthetic ammonium sulphate. In 1948 this product took about 190,000 tons of acid. Today it is up to 760,000 tons.

Titanium dioxide is responsible for

the tremendous surge in acid consumption in the paint and pigment industry. The spurt in acid demand for petroleum refining and for iron and steel reflects the big increases in those process industries.

Where It Comes From

The S for H_2SO_4 Raw Material	1939	1944	1949	1950
		(Percent)		
Sulphur	64.0	75.0	80.8	81.5
Pyrites	23.3	14.7	12.6	13.0
Smelter gases	11.9	9.6	5.8	5.0
Other	0.8	0.7	0.8	0.5
Total	100.0	100.0	100.0	100.0

Raw material problems of the acid industry focus attention on the table above that shows raw materials used. It emphasizes the changes that have taken place in the raw material pattern, also points up why we are beginning to find Frasch-process sulphur inadequate to meet our growing needs.

What does this mean? Simply that we must take steps to improve our Frasch-sulphur supply. Or else find more economic means of making use of the vast quantities of sulphur-bearing materials that could be put to work in making sulphuric acid (see *Sulphur*).

SULPHUR

Brimstone's Hell

Sulphur created quite a stir late last year when production began to lag behind shipments by 87,000 tons a month. Although output at Frasch-process mines reached a corking 5,200,000 long tons, producers' mine stocks dwindled to 2,225,000 tons by year's end. Present Frasch mines are operating at capacity, but cries of "more sulphur" grow louder. Where can we get it?

Domestic shipments of brimstone last year totaled 4,180,000 tons. Sulphur shipped from fuel gases climbed 28,000 tons to reach the 70,000-ton mark. More domestic and imported high-grade pyrites helped out sulphuric acid producers, who no longer scorn these "brasses."

Fortunately, pyrites is fairly plentiful and widely spread throughout the country. Technical advances may reduce the present 2:1 cost ratio between pyrites and brimstone-burning contact plants. Another possibility is to use low-grade ores as a source of sulphur oxides. This may yet become an important supply factor in the future.

Our preliminary estimates show that pulp operators took the lion's share of the non-acid sulphur used last year. Sulphite pulp alone used from 325-400,000 long tons. Sulphate and semi-chemical pulp took about 50,000 tons.

Carbon bisulphide used about 170,000 tons, sulphur dioxide 25,000 tons, and other chemicals (including dyes) consumed at least 50,000 long tons of brimstone.

Insecticides and fungicides also take bigger and bigger tonnages of sulphur. Some industry experts feel that this market has reached the 125,000-ton mark. They also believe that rubber may take as much as 70,000 long tons a year. It's not easy, however, to get at an accurate figure for the rubber industry without knowing how much is used at each plant; sulphur content of rubber products jumps all over the map. Hard rubber goods have very high sulphur percentages; tires, tubes and mechanical rubber goods each take different percentages.

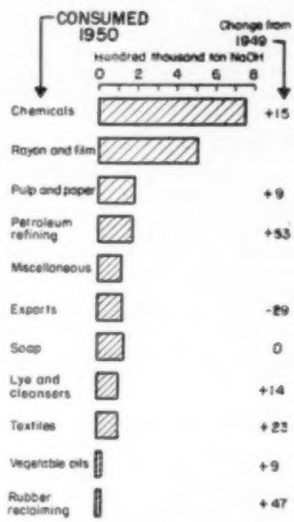
Bigger acid capacities pose a problem: Before any new sulphur using acid plant is placed on stream, a good sized sulphur pile has to be built up. This means that sulphur deliveries to new plants are always well above actual requirements during the initial operating period. Even expanded capacity at existing plants means a build up in plant stocks to keep a normal operating inventory on hand. All this plus the higher operating rates of acid plants has resulted in a building up of users stocks of sulphur at a time when mine stocks were dwindling. It does not mean that acid-makers were building up excessive stock piles of sulphur over the past year, but the fact remains that higher acid producing rates resulted in an apparent increase of consumer stocks that exceeds 100,000 long tons of sulphur. With futher expansions in acid capacities due in the next few years, this build up will continue.

Overseas exports of domestic sulphur have recently been trimmed to 200,000 long tons for the first quarter of this year. (They were 1.1 million in 1950.) On an annual basis, this releases about 300,000 tons to domestic users—which permits production at Frasch-process mines to balance out with the 1950 rate of domestic consumption.

This will solve the short-range crisis; the long-range problem is a knottier one. In the not-too-distant future we must face the fact that our Frasch-mineable reserves are dwindling fast (unless some smart engineer finds a way to tap the underwater reserves along the Gulf Coast). Or maybe Mexican domes can be operated economically.

Our chemical economy has never found it attractive to extract the sulphur values of our almost inexhaustible deposits of natural sulphates such as gypsum. Yet the day may arrive when such a process will have to be used. Technological advances may throw a much rosier light on what today is an unattractive prospect.

Chemical Construction Co. is building a 200-ton-per-day sulphur recovery unit in Columbia. They are using low-grade sulphur-bearing ores. Estimated operating cost of this plant is $12 per ton. The product purity is about 99 percent. The firm estimates that similar units can operate economically in the West.



CAUSTIC SODA

No Comet's Tail

Out of the buyer's market went caustic. Here's the reason: Increased demand in the chemical, petroleum refining, rayon, and pulp and paper industries pulled it out of the doldrums last year. Only a small amount of the increment was created by the war effort (whose full impact will hit this year).

Actually caustic benefitted to some degree when part of its output was curtailed. This was caused by the al-

kali strike which dug a big 630,000-ton hole in the annual soda ash supply. Many firms were forced to switch to caustic, as a temporary expedient, for some processing steps in the pulp and paper, chemical, cleansers and petroleum operations.

Where It Goes

Tons NaOH Used In . . .	1949	1950
Soap	145	145
Chemicals	680	730
Petroleum refining	130	200
Rayon and film	450	475
Lye and cleansers	110	125
Textiles	90	100
Rubber reclaiming	15	22
Vegetable oils	22	24
Pulp and paper	170	185
Exports	185	130
Miscellaneous	147	94
Total	2,140	2,280

Of late, the trade has fallen into the habit of picturing caustic soda as something like the tail of the chlorine comet. This was not true last year. Caustic broke off, for once gave producers some relief from the worrysome problems of finding new outlets in a saturated market. Lower exports and relatively high imports during 1950 also reflected firm domestic markets.

Caustic imports arrived at prices well above the contract prices existing here. The result was only distress buying—plus some resale business. Evidently the price of European caustic will keep it from becoming an important influence in the United States markets.

CHLORINE

Skyward Ho!

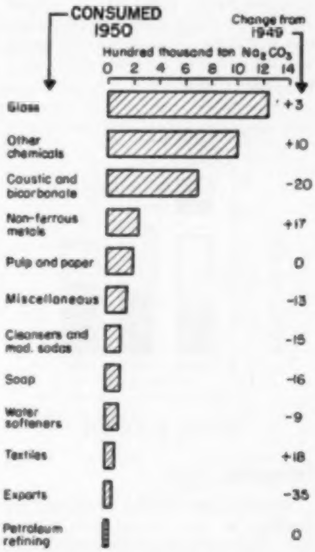
Of all the stars in the chemical heavens, chlorine shines most brightly. Month after month production records for this versatile element are smashed.

Chlorine output last year approached the 2 million ton mark. June's production was at the rate of 2.1 million tons; by October it had passed 2.2 million tons. New units will boost capacity this year, give even a higher rate. At least 1,600 tons per day capacity is being erected.

About 90 percent of your chlorine comes from alkali plants as a coproduct of caustic soda. The rest comes largely from sodium and magnesium operations. A minor amount originates at caustic potash plants and at a single nitrosyl chloride unit.

"Chemicals are mostly used for making each other," one writer quipped recently. For chlorine, there's more truth than quip in this statement; close to 75 percent of all chlorine goes into manufacturing other chemical products. Its use in pulp and paper and in water treatment has dropped from the dominant position of 20 years ago to just about 16 percent of the industry's total output.

Titanium metal—with its promising future—may eventually lift chlorine demand well above present levels. Reason: titanium tetrachloride is an intermediate in extracting titanium from the ilmenite ore. However, today's use in this field amounts to only 2,200 tons of chlorine yearly. If full-scale war comes, this new market, along with most of chlorine's other major outlets, will grow rapidly.



SODA ASH

A Striking Problem

Unlike most chemicals in 1950, soda ash couldn't boast that it had set an all-time record for output. The reason: strikes (see *Labor*).

This enforced cutback was responsible for some drastic scrambling among purchasing agents in the various process industries. Some glassmakers were forced to curtail their container output and imports were stepped up to make up for the shortage caused by loss of output from Solvay and Diamond plants. It also had a considerable influence on the use pattern of domestically produced ash.

Pulp and paper producers, forced to face the problem, switched to other alkalis to keep their plants running. Lime-soda caustic, already giving ground to electrolytic, was slashed back even further. Sodium bicarbonate reflected the shutdown. Exports dropped off sharply, skidded about 33 percent.

Markets Suffered

Tons Na_2CO_3 Used in . . .	1949	1950
Glass	1,190,000	1,225,000
Soap	125,000	105,000
Caustic and bicarbonate	875,000	700,000
Other chemicals	950,000	1,050,000
Cleansers and mod. sodas	130,000	110,000
Pulp and paper	200,000	200,000
Water softeners	110,000	100,000
Petroleum refining	24,000	24,000
Textiles	55,000	65,000
Non-ferrous metals	210,000	245,000
Exports	76,000	50,000
Miscellaneous	175,000	151,000
Total	4,120,000	4,025,000

HYDROCHLORIC

Quick Switch

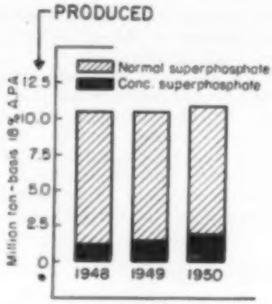
Hydrochloric acid did a flip-flop in 1950. Despite soaring production rates (which hit 700,000 tons annually late last year), the demand rose to meet it.

Relative output from various sources followed the pattern set up in recent years: more byproduct acid. New plants raised byproduct output in 1950 to around 55 percent of the total acid supply. Production from Mannheim furnaces stayed at a 14,000 ton-per-month clip; hydrogen-burning units eased up to an 11,000 ton-per-month output by October.

Higher production of anti-knock compounds; the widespread use of hydrochloric acid in oil-well treatment; an expanding demand in the metal industries—these are the things that have been responsible in large measure for the quick switch from a surplus to a near-balance status.

Better distribution systems have helped to get rid of the charge of "provincialism." Barges now bring Gulf Coast acid to the industrial East and Midwest at reasonable prices; this has done much to eliminate the "local surplus" problem of the Gulf area.

If war needs give a real push to plans for converting HCl to chlorine, then lowly muriatic may well become the balance wheel in our delicate caustic-chlorine economy.



PHOSPHATES

Concentrate

Phosphates for both chemicals and fertilizers have continued to grow in the past year. As war threatens to take a bigger bite of our chemical phosphorus and phosphoric acid it's clear that allocation of elemental phosphorus is in the cards.

Expansions planned or under way will lift output close to the 200,000-ton level. Yet some uses must be curtailed. Biggest growth factor in the chemical phosphate branch has been the synthetic detergent market—which had its biggest year in 1950 and hopes this year to break its 1-billion pound record. The demand is there. Can producers get the raw materials to satisfy it?

Superphosphate output reached 10,750,000 tons on the basis of 18 percent available P_2O_5. This was some 2 percent above 1949. Concentrated super, however, jumped up sharply. Production at the end of ten months had risen about 30 percent above the 1949 rate. All signs indicate that concentrated super will keep up its steady growth in terms of the percentage of total phosphate fertilizer output. With high farm incomes a sure thing for several years to come, the fertilizer business should prosper.

COAL CHEMICALS

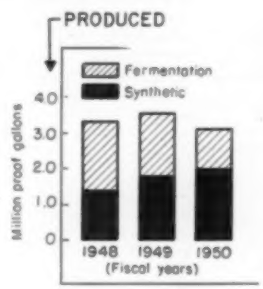
Problem Children

A good part of our upset supply-demand picture stems from the coal aromatics. There are simply not enough of these to satisfy the appetite of the growing process industries.

Benzene, toluene, naphthalene, xylene and cresols: all are tight—very tight. Byproducts from coke-oven operations and tar distilling have been supplemented to a small extent by petroleum-derived benzene. Imports helped to squeeze 1950's benzene supply up to about 180 million gallons.

Petroleum-derived benzene, now only 5-10 million gallons, will be expanded sharply in the next few years even if it does cost more to make it. Government is now prodding several petroleum firms to get into benzene production. Pan American and Shell are already operating units. But still some 20 percent of our benzene needs come from imports and cutbacks in plastics, with polystyrene as the principal victim.

More demands for aromatcis will come as the mobilization program shifts into high gear; more plant capacity will be needed. Here is one big reason: Last year our imports of benzene came from Great Britain, Poland, Czechoslovakia, and Canada. About 38 percent came from the Iron Curtain countries. We cannot, and must not, rely on Red sources—even for a precious dribble.



ETHYL ALCOHOL

Fermenting Again

Alcohol and solvent producers are running as close to capacity as they can. Big hitch is that some aren't able to get enough raw materials to keep the plant pipelines filled. Demand keeps well ahead of supply.

Demand for alcohols and solvents may be less this quarter than for 1950's tail-end quarter. Reason: chances are there'll be fewer automobiles, refrigerators, radios and TV sets. But if defense demands live up to what's expected, production for the next few years will shatter all records.

With one exception, all solvent plants are running to capacity. The exception is ethyl alcohol, which can be made in beverage plants. Allocation is inevitable if (1) industrial activity holds up and (2) if military demands increase. Even though producers might like to increase their output, they probably will be held back for at least two years—unless the project is vital—until materials and labor ease up a bit.

A year ago it looked as if there would be plenty of all alcohols and solvents—in some cases an excess. These "surplus" capacities now comfort the military; but civilians may later be pinched.

As long as the snafu in the Far East exists, synthetic rubber will make demands on ethyl alcohol. Also, military needs not yet revealed could up alcohol by another 50 percent.

If the military tempo increases, demand for synthetic textiles and other products will jump sharply. Present plants will have to be enlarged—but quick.

Here's the solvents industry's plea to our military planners: Let us know what you want while there's still time to do something about it!

Less to Drink

Ethyl alcohol production for 1950 will be about 210,000,000 wine gallons—an increase of some 20 percent over 1949. By the end of 1950 the inventories of both alcohol and molasses were low.

There is practically no molasses available for alcohol production during 1951. Hence any increase in supply will have to come (1) from foreign sources or (2) by cutting back beverage production.

METHANOL

No Freeze Here

The 1950 methanol production, estimated at 132,000,000 gal., is about 5 percent more than 1949 output: pattern for the year was similar to that of ethyl alcohol. Supply was greater than demand during the first quarter; producers even tried to get rid of their surplus production in the anti-freeze market. Business was taken as low as 22 c. a gal. delivered, was freely offered to small jobbers at 24 c. Results: demand for completely denatured alcohol for anti-freeze dropped to about 5,000,000 gal., demand for the methyl-isopropyl blend was cut.

Because of the mild winter, the anti-freeze demand itself was below normal; season's end saw as large a carryover as for the year before. In most cases sales were not over 50 percent of those for the previous season.

Raw material shortages, strikes, military and increased industrial requirements—all these pinched the supply for methanol. By the end of the season large producers were buying the stuff off-shore and the price structure advanced to 32-35 c. a gal. By the end of the year producers were allocating on the basis of only 80 percent of 1949 uses. Net result: formaldehyde makers, faced with a booming market, are again worrying about raw materials.

Production of wood distillation methanol was spotty. For the most part it was sold as anti-freeze.

ISOPROPYL ALCOHOL

Ethyl's Loss, Iso's Gain

All isopropyl alcohol producers operated at capacity during 1950. All disposed of their entire production. By the end of the year none had inventories, all had a backlog of orders.

As a result of the high prices of ethyl alcohol, marginal users swung back to isopropyl. In many cases they found they could not cover. New uses for isopropyl had developed and producers were unable to take more business.

KETONES

Painters' Worry

Acetone was firm during 1950. Output was slightly less than in 1949. During the first half of the year the demands were spotty, but these firmed with the increase of textile business during the year. The decline in fermentation production made acetone tough to get by the end of the year.

Production of methyl ethyl ketone was higher than in 1949 even though one producer lost output from plant difficulties. Demand for MEK topped production for the whole year. This was brought about by an increase in vinyl production and by high-price acetic acid (made from high-cost ethyl alcohol) that put a competitive handicap on the low boiling acetates. By the year's end, MEK was actually short. If demand increases, it will join chlorine, benzene and phthalic anhydride in the "get-some-if-you-can" class.

Methyl isobutyl ketone, like methyl ethyl ketone, was in strong demand both as a nitrocellulose solvent and for vinyl resins. As always, increased output of this material took acetone from the market; this naturally strengthened acetone and isopropyl markets.

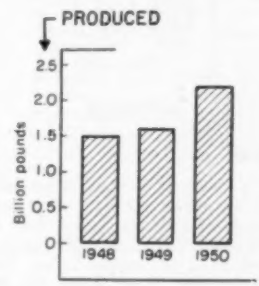
HIGHER SOLVENTS

Sometimes out of Reach

High demand, stemming from the industrial requirements for durable goods, created a firm market for normal butyl alcohol and acetate. Demand for the alcohol went up 30 percent, for the acetate 20 percent. Fermenters apparently put what molasses they had into butyl alcohol for one good reason: butyl pulled a higher price than ethyl.

Sales of secondary butyl alcohol and acetate—along with isobutyl alcohol and acetate—were limited only by availability of acetic acid.

The one synthetic amyl producer elected to fill the demand of antibiotic producers and once more to relinquish his place in the solvents market. Prime result: there was a shortage of higher alcohols. Secondary result: some formulators had to turn to other solvents.



PLASTICS

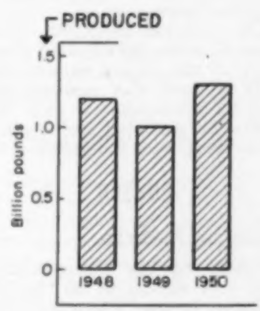
Straining at the Leash

War has a swift and terrible impact on the plastics industry. Shortages of raw materials bottleneck the flow of finished products just as the need for these soars. The delicate balance of the industry is thrown out of kilter. New production facilities can't be pushed fast enough to stave off early chaos.

Production of all synthetic resins (including protective coatings) jumped last year—and jumped right over the 2 million mark. This is a gain of more than 30 percent over 1949. Benzene, the big bottleneck during 1950, will probably continue to hold back phenolics, polystyrene and nylon for the next few years. There simply won't be enough benzene after the rubber plants take out their bite.

Rising civilian demands accentuated the shortages of most plastics raw materials. In general, no huge new uses for resins or plastics turned up last year. Unless you want to cite polyethylene as the exception that proves the rule. Here the 50-60 million pound capacity was not enough to meet the rising demand by both armed forces and civilians. Capacities will be increased this year.

New facilities put in by Bakelite, Du Pont and others will operate by this summer—to jack the nation's total capacity for plastics materials up close to 100 million tons a year. Even this may not be enough; the extrusion and molding industries are clamoring for more.



SYNTHETIC FIBERS

Acrylics Take Hold

Polyacrylonitrile became our newest commercial synthetic fiber in 1950 as Du Pont's Orlon capacity was expanded at Camden, S. C. This year a staple plant will supplement output of the yarn plant there. Carbide's Dynel staple (a copolymer of vinyl chloride and acrylonitrile) is to be expanded. New facilities are being put up (see *Plants and Processes*).

Demands for polyacrylic fibers are nearing the present 28,000,000 lb. capacity mark. Estimates of 100,000,000 lb. capacities by 1960 are already much too conservative.

Expansions by Chemstrand and Carbide will make polyacrylic fibers a force for wool to reckon with in the next few years. As nylon and rayon captured the silk market, so too are the newer synthetics aiming at a share

of the wool market. Fiber V, which is polyethylene terephthalate, is being test-marketed. Du Pont plans to produce it in a plant originally earmarked for nylon.

Nylon has not taken a back seat in this year of high textile activity. About 115,000,000 lb. of this fiber flowed into the consuming market in 1950.

In spite of this record, demand was not satisfied. Chemstrand has been toying with the idea of getting a license from Du Pont to produce nylon as a means of broadening its operating base.

Rayon also felt the return of a seller's market long before the outbreak of war in Korea. Consumption was more than 30 percent ahead of 1949; even the "slow" months of February and April shot above the average monthly mark for any prior year. All segments of the market helped to make 1950 the best year in rayon's illustrious history.

This year will see 1950's record topple as textiles feel the influx of war orders. Trade sources estimate that world synthetic fiber capacities will reach 4.2 billion pounds in 1951. The world-wide synthetic fiber business booms along on an all-out basis.

RUBBER

Rebounding Headache

Rubber was the behind-the-scene cause of a number of our chemical headaches last year. The rubber industry was the first to mobilize—and it gave a good account of itself.

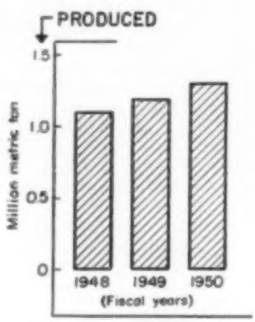
All-time records of production and raw material consumption were scored in spite of tough supply and cost problems. Rubber consumption leaped to a record 1,240,000 long tons—up 25 percent from 1949 and 10 percent from the previous 1947 record. Of this total, 529,000 long tons was synthetic.

Two big factors in the supply picture were (1) the unbelievably high demand for natural rubber in this country and the rest of the world and (2) the heavy impact of the government's stepped-up stockpiling program.

Since the Korean War got under way the government has been hard-pressed to meet all demands for either general purpose GR-S or butyl rubber. But John L. Collyer, president of B. F. Goodrich, believes that the rubber industry can comfortably supply all this year's military and essential civilian needs. All-out war or armed outbreaks in the Far East's rubber growing areas could—and would—change this mighty fast.

U. S. Rubber's Harry Humphreys, Jr., agrees in general with Mr. Collyer. But he points out that some civilian rubber products may get short early in the year until synthetic output takes up the slack created by cuts in the use of natural.

If full-fledged war comes, the rubber industry can convert to a war footing faster than most industries. That's because military and civilian uses of rubber are so similar. Tires take the biggest bite.



NITROGEN

Where?

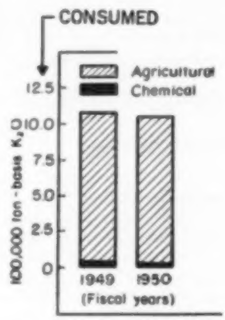
The sweep of war and of preparedness has blown nitrogen off its easy position of early last year. Many experts then predicted that ammonia would be in over-supply by late 1949 or early 1950. Korea perforated that prognostication.

In October—latest month for which figures are available—production of ammonia, nitric acid and ammonium nitrate hit an all-time high. Ammonia output at the year's end was clipping along at a rate of 300,000 tons ahead of the 1,294,000 tons turned out in 1949. Ammonium nitrate was also running about 300,000 tons ahead of 1949. Nitric was well above its early 1950 pace.

Use of anhydrous ammonia has increased rapidly in the past few years. Anhydrous and its solutions now supply more than 30 percent of all chemical nitrogen consumed in fertilizers; in 1947 they supplied only 4 percent.

Ammonium sulphate fell behind liquid ammonia in 1949, when it supplied some 20 percent of the nitrogen content of fertilizers. Synthetic ammonium sulphate passed byproduct sulphate from coking plants in 1949 for the first time; it forged further ahead in 1950.

Demand for anhydrous ammonia and its compounds for use in producing amino plastics, synthetic fibers, refrigerants, and urea has zoomed in recent years. No real leveling off is in sight.



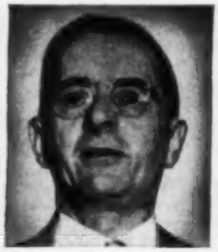
POTASH

Still Short

Potash demand remained high throughout the year. The strike at Carlsbad, N. M., tied up about 85 percent of our producing capacities in the early part of 1950. This created a shortage that kept producers well behind demand all through 1950. Producers are moving to expand output of both chemical and fertilizer grade potash salts. Even new capacities will not satisfy the rapidly growing demands that war economies place on potash. Fertilizer producers are also searching for all the potash that they can get. War means that food requirements grow and fertilizers are the items that boost our crop yields up to the levels that we will need in our fight against communism. Result: Output will jump this year.

Potash Co. of America is building a Hargeaves type plant that will add to the growing supply of hydrochloric acid (see *Plants & Processes*). This addition to the sulphate of potash supply will be absorbed into the market as soon as the plant goes on stream. Two new prospective producers entered the potash picture in 1950. They are Duval Sulphur & Potash Co. and Southwest Potash Co. They are joining the three present producers in the New Mexico area.

LABOR


UMW: A. Dennie Lewis CIO: Martin Wagner AFL: H. A. Bradley

"Our union can report a remarkable growth of members."
"We expect to continue pushing the work of organization."

TRENDS

. . . Thrown Into Reverse

Korea, with President Truman's decision to mobilize to the hilt to be ready for whatever may follow, reversed during 1950 the trend in labor developments as it did in many other fields. And chemical processors are right in the middle of it.

Unions, satisfied in 1949 with pension and health insurance plans instead of higher wages, put over a fifth-round wage increase. Now we're getting wage controls while, paradoxically, higher minimums are being set for wages paid on government contracts in chemicals and other industries.

Strikes, down in 1949, shot upward as usually happens when business booms. Soon we'll have something like the War Labor Board to settle labor disputes, and possibly a no-strike pledge.

Manpower, once so plentiful that the White House sponsored a program of funneling work on government contracts into areas of high unemployment, is now tight, and getting tighter. So tight, in fact, that we'll gradually get into manpower controls—remember the certificates of availability?—and a longer work week.

The surplus of chemical engineers, chemists and other professional personnel suddenly turned into a shortage. How to hang on to key personnel—mainly reservists—and how to keep the draft from nipping scientists in the bud has become a major problem on the industrial front.

Employment shot upward in chemicals, as in all industries, reaching record levels, while unemployment shrank to an almost irreducible minimum of less than 2 million.

Stepped-up tempo of business in all fields has spurred unions to greater organizing efforts, and chemicals are no exception.

Communists in critical industries have become a group to keep a sharp eye on. Congress recognized this last year when it put the McCarran Subversive Control Law on the books. But the law isn't being used yet, and some employers who have taken a hand themselves against Commies in their plants have been stymied by arbitrators or the Taft-Hartley Labor Law.

Taft-Hartley is here to stay for the foreseeable future. Korea and organized labor's flop in the elections decided that.

. . . THERE IS STRENGTH

Get 'Em Young

Union organization in chemicals is being intensified to keep up with expansion of the industry. New workers coming on the job are prime targets, as are new plants. Where only part of a multi-plant company is organized the unions are going after the unorganized plants to complete the job. The AFL, CIO and District 50 of the United Mine Workers have all stepped up these activities.

To bolster the organizing drive, the CIO hopes eventually to merge its oil and chemical unions. O. A. Knight and his Oil Workers, with 77,000 members, are willing. The Chemical Workers—50,000 members—are not. Both these unions will go after the chemical plants, the Oil Workers taking on those near the oil refineries

Onto the Escalator

Unions swept up odds and ends of pension and welfare plans before Korea. Where there were wage increases, most were around 5 c. an hr. After Korea, they jumped into the 10-15 c. bracket.

Moreover, the cost-of-living escalator clause, adopted by General Motors two years before, suddenly became popular not only in the auto industry, but in chemicals and other industries as well. Unions considered this the best way to hedge and protect their members' real wages against rising living costs. These clauses, tied to longer contracts, also assured employers a measure of wage stability.

Chemical companies agreeing to adjust wages, usually quarterly, according to changes in the Bureau of Labor Statistics consumer price index include Monsanto, Allied Chemical, Dow, General Aniline & Film, Wyandotte, Mathieson, Lever Bros. and Harshaw.

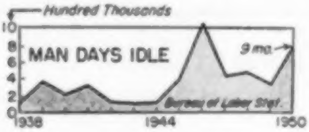
Lengthening the Long Green

Higher minimum wages, ranging from 85 c. to $1.40 an hr., are now mandatory for work on government contracts of more than $10,000 in the industries producing chemicals and allied products. This means a lot to payrolls as rearmament steamrollers. (The government let $50 million in chemical contracts in fiscal '50. And that's only the beginning.)

By far the highest rate established to date, was a minimum of $1.40 an hr. in the bone, carbon and lamp black branches of chemicals. Secretary of Labor Maurice J. Tobin, acting under the provisions of the Walsh-Healey Public Contracts Act, established it.

A minimum of 85 c. an hr. has been set for workers making cleaning and polishing preparations, insecticides and fungicides, and miscellaneous chemicals. A hike to $1.15 an hr. has been established for workers in the industrial and refined basic chemicals branches. However, in the South these workers will be guaranteed a minimum of only 95 c. an hr. Higher minimums are due in paints, drugs, pulp and paper, explosives.

Previous floor under wages was an over-all minimum of 75 c. Now the unions can start all bargaining from a higher floor



STRIKES

He's Out

Any way you look at it, the 1950 strike picture was darker than 1949, except in mining. That is not surprising, because 1949's 72 strikes in chemicals was the best record since 1942. Last year's totals aren't in yet, but during the first nine months there already had been 68 strikes—only four more to go to pass 1949.

Look at the number of workers involved and the man-days of idleness. With 33,000 chemical workers affected and 725,000 man-days lost by strikes, the nine-month figures for 1950 already were higher than the 1949 totals.

Solvay, together with Diamond Alkali, and briefly, Wyandotte, suffered the most damaging strike, soda ash. It lasted more than two months, running from July into September. Its cost: about 630,000 short tons of ash production. Hurt especially were makers of glass, rayon, textiles, paper, synthetic rubber, detergents and phosphate chemicals.

Plaskon spent 90 days out last spring. Even so, the workers at this division of Libbey-Owens-Ford failed to get the area-wide pension plan they sought, settled for 10 c. an hr. and other gains.

Columbia Chemical Division of Pittsburgh Plate Glass got the first three-year labor contract in Greater Akron's mass-production history. Workers get a 5 c. hike in '50, '51, '52; no wage renegotiation until contract expiration.

Hooker Electrochemical Co. granted a 6 c. boost on a five-year contract. Also: company pays 4/5 of hospital insurance cost, all of state disability insurance charges; and it has liberalized holiday and vacation benefits.

Carlsbad potash workers threw in the sponge after 74 days of picketing had brought nothing but a court injunction against them. The union survived though.

Taking the Pledge

Truman would like to get a no-strike pledge in the national emergency, but won't ask for it until he is sure labor will come through. Chances of getting it, short of war, aren't good. Some employer spokesmen are against asking a no-strike pledge, until really necessary, because of concessions that labor will want.

MEN

US: Uncomfortable Shortage

Manpower is tight as a drum. All industry, not alone CPI, will be plagued by the developing shortage of skilled technicians, including chemical workers. All kinds of engineers are badly needed. By 1954 there will be a cumulative shortage of over 40,000 engineering graduates. Normally, in peacetime at least 20,000 graduates are needed each year, of whom some 1,500 are chemical engineers. In the present crisis, despite the fact that it has absorbed the abnormally high number of 50,000 new engineers in each of the last two years, industry is competing fiercely for this year's 30,000 graduates.

USSR: Unusual Supply Seems Ready

The Russians, in their current five-year plan, reportedly were scheduled to have produced 150,000 engineering graduates by the end of 1950. This matches our own output for the same period. During the next five years, however, we will drop by one-third unless drastic action is taken to increase the supply of engineering freshmen and to continue the training operation in full force.

There's a Draft

Draft rules will be changed this year. Present draft age is 19 through 25, and veterans are exempt by law. Married men have a blanket deferment. The draft age is likely to go down to 18, at least for training purposes. Married men and veterans are likely to be drafted before the age is raised.

Purely Voluntary

Manpower controls are coming, but not right away. Voluntary controls are being tried first. Employers are being urged to hire through public employment offices, avoid pirating, utilize workers — especially engineers and skilled technicians—at their highest skills, and to inaugurate in-service training programs for engineers and new workers. More women and older persons are also coming into the labor market.

EMPLOYMENT

An Hour a Week

Chemical workers engaged in actual production increased through 1950 to bring the employment index to an average of 178.2 for 11 months, compared with an average index of 148.8 for production workers in all manufacturing during the same period. Chemical workers averaged an hour a week more than all production workers, 41.4 compared with 40.4 hr. per week. And they earned an average of $1.501 an hr. during the first 11 months of 1950, compared with $1.455 for all production workers.

Total number of employees in chemicals and allied products last year rose from 658,000 in January to 717,000 in November. This 9 percent increase is behind the 12 percent rise in all manufacturing from 13,980,000 in January to 15,707,000 in November 1950. Demand for chemical workers is still increasing. Reopening of all the synthetic rubber plants will create

MIGRAINE OF THE QUOTED INDUSTRIALIST

"We've got more reservists than engineers. Who'll run the plant, IBM?"
"Our industry is classified A-1 for defense; our technicians 1-A for draft."
"Under present draft regulations, we'd lose 60 percent of our engineers."
"Present trend of mobilization will soon cause a cutback of development work."
"In our technical departments 38 percent are reserve officers."
"Present policies will delay design for plants essential to defensive effort."
"Of our 6,000 technical personnel, 25 percent are reserve officers."
"768 engineers are employed in our research; 30.3 percent are in the reserve."
"Shortage of engineering manpower is one of our greatest concerns."
"1,440 technically trained men . . . 60 percent are potential losses to the armed forces."
"We have found it impossible to secure experienced engineering personnel."
"We now have vacancies for 77 engineers."

5,000 new jobs, and this is but one of the burgeoning process industries. Acute shortages of skilled technicians exist around the Great Lakes, in the Southwest and on the West Coast, all important chemical centers.

And Safe

The chemical industry worked hard last year to match its safety record for 1949—the best year ever. It was a close finish. While final results are not in yet, work-injury figures for the first nine months of 1950 made this much clear: the nine-month 1950 injury rate just about matched the rate for the first nine months of 1949. But it was about 8 percent behind the rate chalked up in 1949 over the full year. So unless the frequency of injuries dropped in the fourth quarter, as happened in 1949, the 1950 safety record will run behind 1949. Synthetics appear to have regained the leadership they lost in 1949 to explosives plants. Synthetic rubber and synthetic textile fibers had the best records at the three-quarter mark.

RED, WHITE & PINK

Hire? No! Fire? Maybe!

From now on, Communists may cause more trouble in your plant, and getting rid of any who manage to squirm into jobs won't be easy.

The McCarran Internal Security Law, passed in 1950, makes it unlawful for a Communist to work in a defense plant and for a fellow traveler to work in a plant without making known his left-wing connections. But this part of the law has not been set in motion. It does not apply to your plant until the Secretary of Defense has publicly designated it as a "defense facility."

On classified government contracts, persons of questionable loyalty may not have access to classified information, but that doesn't mean you can kick them out of the plant. It only means you must keep them on non-classified work.

If you fire a Communist outright, you may run into trouble under your union contract, especially if the worker is a hot union man. You may be accused of an unfair labor practice. Or an arbitrator may find you had no valid cause for firing the person, maybe because security is not involved.

PROFIT & LOSS

BOOM

Happy New Year?

Excess profits taxes will certainly make inroads into 1951 earnings of firms in the chemical process industries. What's more, they'll continue to be a burden for some years ahead. Mobilization costs will influence net earnings after taxes for the duration of the national emergency.

All indicators point up the fact that we are moving through another phase of the ideological clash between capitalism and communism. This means that we must face the problems as they appear, that we must realize these are a part of the price of maintaining our existence as free men and as free industries.

But there is no reason to wrap ourselves in coluds of gloom as we face the future: earnings may well surpass present rates even though percentages do drop.

Financially, the past year was a good one. Earnings were up above 1949 levels in almost all cases. All big guns of the chemical industry—like Du Pont, Carbide, Monsanto, American Cyanamid, Eastman Kodak, Sterling Drug, Chas. Pfizer and Penn Salt—showed substantial hikes in their earnings.

The financial snapback of a number of firms reflected the swiftly changing tide in supply and demand. Take rayon, for example. Celanese earnings at the three-quarter mark were three times as great as the corresponding 1949 levels. Those of American Viscose doubled. These figures reflect the sharp switch from a buyer's to seller's market as rayon sales surged back to chalk up new records in 1950 after a bad quarter in 1949 had put a big dent in producers' earnings (see *Supply and Demand*).

Firms like Esso, Lion and Phillips found 1950 a profitable year by many standards—including the figures entered on the balance sheets.

Magnitude of the increased earnings of Du Pont is the most impressive of all the figures in the accompanying table. Net income for the first nine months of 1950 was more than $82 million above 1949's nine-month earnings of $136-million.

With expansions now arriving on the scene this year, further substantial increase in earnings can be expected; however, heavier taxes will dig into

CPI Firms' Net Income Shows Gains

Selected Firms	Nine Months 1950	1949
Abbott Laboratories	$8,343,838	$8,904,680
Air Reduction	6,477,123	4,901,897
American Cyanamid	25,906,717	9,813,210
American Potash & Chem	1,906,930	1,169,847
American Viscose	34,845,000	11,486,000
Bristol-Myers	3,148,434	2,168,040
Celanese	32,994,645	10,908,870
Cities Service	57,378,354	30,834,258
Corning Glass[1]	12,308,352	4,033,137
Dow Chemical[2]	11,904,112	5,957,148
Du Pont	218,627,909	135,904,735
Duval Texas Sulphur	985,326	723,180
Eastman Kodak	43,134,237	34,478,068
Freeport Sulphur	4,735,414	4,016,131
Glidden[2]	4,587,172	3,677,863
Hercules Powder	10,570,118	7,373,722
Heyden Chemical	1,480,929	1,168,173
Hooker Electrochemical[2]	1,206,400	842,100
Industrial Rayon[3]	2,917,777	1,607,000
Interchemical Corp	3,394,324	1,307,070
Jefferson Lake Sulphur	912,748	428,480
Koppers	7,970,722	5,356,242
Lindsay Light & Chemical	277,121	266,377
Libbey-Owens-Ford	22,057,173	15,306,909
Lion Oil[3]	3,367,269	1,728,482
Liquid Carbonic[4]	981,937	640,425
Mathieson Chemical	6,496,551	5,190,700
Minnesota Mining & Mfg	16,980,880	9,942,407
Monsanto Chemical	20,763,781	11,555,923
National Distillers	16,124,978	15,831,817
Nopco Chemical	906,176	351,088
Parke, Davis	13,845,660	9,628,560
Penick & Ford	2,009,825	1,565,379
Penn Salt	3,136,601	2,108,268
Pfizer	6,777,087	6,194,535
Phillips Petroleum	35,865,522	22,684,668
Pittsburgh Coke & Chem	844,960	627,398
Pittsburgh Plate Glass	32,287,806	25,851,091
Plymouth Oil	6,098,387	4,306,167
Publicker Industries	5,480,640	1,487,577
Rayonier	7,518,478	4,106,819
Rohm & Haas	1,838,000	1,204,000
Sharp & Dohme	5,127,938	4,856,341
Shell		
Squibb[4]	1,917,385	1,444,083
Standard Oil (N. J.)	274,500,000	186,000,000
Sterling Drug	11,213,202	11,090,772
Sun Chemical	1,600,487	868,379
Texas Gulf Sulphur[2]	6,387,378	5,672,002
Union Carbide	99,410,080	66,429,302
U. S. Gypsum	23,072,379	16,100,252
U. S. Rubber	15,857,158	8,619,800
Victor Chemical	3,078,617	1,982,883

[1] Net income for 40 weeks. [2] Third quarter.
[3] Nine months to July 31. [4] Nine months to June 30.

Du Pont as well as other chemical and processing firms. One of the unfortunate phases of excess profits taxes is the retarding effect that they have on growth companies; the chemical process industries, with few major exceptions, has been built of growth companies.

Strikes made headlines again this year. They were reflected in earnings of firms like Allied and Diamond who bore the brunt of the June-September alkali strike.

Allied's interim report shows that 1950 six-month sales were up 5 percent over those of 1949. Net income of $2.38 per share was 9 percent higher, adjusted for the long-awaited (see Chemical Engineering, Feb. '50) 4-for-1 stock split made on the first of August. Sales in the third quarter were 10 percent higher than a year earlier. But they were 5 percent less than the second quarter sales—mostly because of the Solvay Division strike mentioned above.

Although hit earlier in the year by the coal strike, sales of Atlas Powder rose 15 percent. Atlas had a 2-for-1 split in July and adjusted earnings reached $3.44 per share for the first nine months of 1950 compared with $1.87 in the same 1949 months.

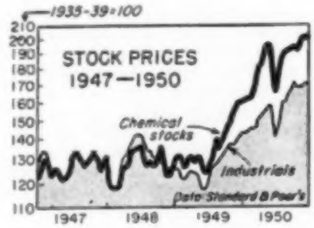
Sales Unfurled

War has placed in increased load on the antibiotics producers—firms such as Chas. Pfizer, American Cyanamid, Merck, Commercial Solvents, Heyden, and Bristol Laboratories felt the rejuvenating influence of better markets. However, Abbott Laboratories ended up nine months of 1950 with earnings off slightly from 1949 levels.

Introduction of Terramycin and Viomycin helped Pfizer's ledger. Aureomycin played a big part in Cyanamid's success in 1950. But arrival of acrylic fibers gave the company a lift on the profit side of the ledger.

Commercial Solvents was another firm in which the boost in demand for penicillin contributed only a share of the total increase in sales. Prices of alcohol and other solvents rose rapidly in 1950 and as better profit margins returned to the solvents markets, Commercial cashed in on them.

Harder hit by the solvent slump in 1949 was U. S. Industrial Chemicals. But with the return of higher ethyl alcohol prices plus a diversification program that takes in petrochemicals and a growing insecticide output, U.S.I. resumed dividend payments in August. Final net income for 1950 is close to four times the previous year's rate.



High as a Kite

As a whole, chemical stocks climbed like a jet last year. Price indexes prepared by Standard and Poor show that investors thought the chemical firms were doing a bang-up job. Prices of chemical stocks continued to pull away from the average industrial stocks. Based on 1935-39 = 100, chemical stocks opened the year at about 160, closed at 200. Meanwhile, all industrials had climbed to only slightly more than 170.

Like chemical management, investors feel that the challenge thrown out by Moscow will be met and turned back—turned by industry's traditionally agressive approach to production problems during times that try mens' ingenuity.

Good, Getting Better

As 1951 gets under way the chances of new records for chemical sales seem to be a sure bet. All the chemical firms as well as processing firms will be running full blast to meet defense and civilian needs. But, last year will be a happy memory.

Major synthetic resin producers also enjoyed a year of record-breaking production. Rohm & Haas—with a large

CPI Stocks Show Big Gains

Selected Firms	Dividend Dollars/share	Sales M Shares	Dollars per Share: High	Low	Year End	Net Change
Abbott Laboratories	1.60[1]	407	54⅛	39⅝	44⅞	− 6⅛
Air Reduction	1.40	806	28⅞	20⅛	27⅛	+ 4⅝
Allied Chemical & Dye	2.00[1]	327	60⅝	53	59	......
American Agric. Chem.	3.00[1]	95	53⅝	40	49	+ 4⅝
American Cyanamid	4.00[1]	1,600	76⅝	40	72⅝	+21⅞
American Viscose	1.00[4]	67	64⅛	54⅛	73	......
Atlas Powder	1.80[4]	81	40	28⅛	30⅝	......
Bristol-Myers	1.60	34,209	31⅛	23¼	30⅝	+ 2⅛
Celanese	3.00	1,056	47⅞	20⅝	47⅛	+15
Colgate-Palmolive-Peet	2.00[4]	219	50⅛	37⅝	46⅛	+ 3⅝
Commercial Solvents	1.00[1]	935	24⅛	15⅝	22⅝	+ 2
Corn Prod. Ref.	3.60[5]	319	72⅞	62	68⅝	− 3⅝
Corning Glass	1.00[1]	329	48⅛	28⅞	38⅝	+ 9
Davison Chemical	1.80	278	31	18⅝	31	+ 8⅛
Dow Chemical	2.40[1]	800	83⅛	54⅛	78⅞	+23⅝
Du Pont	5.35	2,137	85⅝	60⅛	84	+22⅝
Eastman Kodak	1.70[6]	801	52⅝	40	46⅛	− ⅝
Ferro Enamel	1.45[1]	200	23⅛	16⅝	18⅛	+ ⅛
Firestone	4.00[1]	265	86⅛	52⅛	82⅞	+26⅝
Food Machinery	1.12	35,281	37	24⅛	34	+ 5⅛
Freeport Sulphur	5.00	135	81	56	80	+20⅝
General Tire & Rubber	1.00[1]	228	34⅝	19⅛	34⅛	+15
Glidden	2.00[1]	560	31⅛	22⅛	27⅝	+ 2⅛
Goodrich	4.00[1]	228	128⅛	69⅝	124⅛	+54⅛
Goodyear	4.00[1]	575	66⅝	43⅛	66	+21⅛
Hercules Powder	3.30	286	69⅛	49	65	+12⅝
Heyden Chemical	0.80[3]	996	19⅝	10⅝	19⅛	+ 2⅛
Hooker Electrochemical	1.60[1]	184	47⅛	33⅛	44	+11
Industrial Rayon	3.00[6]	199	68⅛	42⅛	68⅛	+16
Interchemical Corp.	2.00[3]	202	23⅞	16⅞	23⅝	+ 5⅝
Int. Min. & Chem.	3.20	349	56⅛	31⅝	55⅛	+21
Koppers	2.00[1]	414	37	24⅝	36⅛	+ 7⅛
Libbey-Owens-Ford	2.50[4]	399	39⅛	30⅝	31⅛	......
Lion Oil	2.00	671	44⅞	28⅛	41⅛	+10
Liquid Carbonic	1.00[1]	202	21⅛	14⅛	19	+ 1⅝
Mathieson Chemical	1.60[1]	154	31⅝	24⅛	29⅛	......
McKesson & Robbins	2.40[1]	139	42⅝	33⅛	41⅛	......
Merck	2.00[6]	407	66⅛	39⅝	64	+21⅛

part of its business tied to the plastics industry—marked up a record. Other resin producers also took full advantage of the opportunity to meet a fast swelling demand from most parts of the plastics industry.

Splitting Shares

Following a pattern set by several other companies, Standard Oil Co. (New Jersey) plans a two-for-one split of its capital stock. This will double the number of outstanding shares and probably change the par value from \$25 to \$15 per share. The stock is currently selling for about \$100 a share. Plans call for the split to materialize in June.

Allied Chemical & Dye Corp.'s stock split did not hurt its pocketbook. The company scored higher sales and earnings last year than it has ever put into the record books. Even with its four-for-one stock split, earnings after deductions for a growing tax bill came to \$4.65 per share. For the last quarter of the year, sales and operating revenue skyrocketed to \$116,152,545—up \$26,633,350 from last quarter of 1949. All this in spite of strikes in the third quarter.

Procter & Gamble reports that it had lower earnings in the last half of 1950 than it scored in the same 1949 months. Blame can be placed on the impact of the excess profits tax act which caused the company to revise its earnings figures for the July-September period from \$20 million to \$15 million. Even with these revisions, Procter & Gamble turned in a very respectable \$3.25 per common share for the last half of 1950.

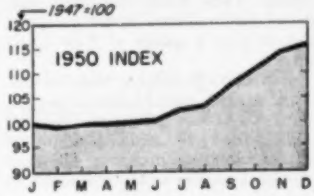
Atlantic Refining on the other hand came through the year with an impressive earnings statement that shows \$13.09 per share net income for 1950 compared with a \$9.51 per share net income for 1949. These figures reflect growth in several lines.

As Record Earnings Flow In

			Dollars per Share			
Selected Firms	Dividend Dollars/share	Sales M Shares	High	Low	Year End	Net Change
Minnesota Mining & Mfg.	3.20	107	151	94	151	+51
Monsanto Chemical	2.50	618	77⅞	54	74⅝	+18¼
National Distillers	2.00	1,541	27⅞	20⅛	27⅝	+ 4⅞
Nopco Chemical	1.60[1]	898	39¼	28	39	+10
Norwich Pharmacal	0.80[1]	141	17⅞	12¾	17	+ 3
Owens-Illinois Glass	3.25	278	79	57⅜	76	+11½
Parke, Davis	1.80	556	46¼	34⅝	41	+ 3¼
Penick & Ford	3.10	578	38¼	31	36⅝	⅜
Penn Salt	2.25	106	64¼	41⅛	54⅝	+10¼
Pfizer	2.00[1]	32,475	85⅛	51⅞	84⅛	+28⅝
Pittsburgh Coke & Chem.	....	......	....	....	....	......
Pittsburgh Plate Glass	2.50	645	40⅞	30⅛	38⅝	+ 1⅝
Procter & Gamble[4]	2.60[1]	25,518	71¼	56	70⅝	......
Publicker Industries	1.00[3]	920	25⅝	13⅝	24	+ 7⅝
Rayonier	2.00[2]	334	40⅝	24¾	47⅝	+20⅝
Rohm & Haas	1.60[1]	95	107½	60⅝	98	+31½
St. Regis Paper	0.60[1]	2,291	12⅛	7⅜	12	+ 3⅛
Schenley Industries	2.00	697	39⅞	28⅝	37⅞	......
Sharp & Dohme	1.70	304	45⅝	33	42¼	+ 3⅝
Shell	3.00[1]	551	56¼	34½	54⅝	+17½
Squibb	1.60[1]	100	40	29½	30⅝	+ 1⅝
Standard Oil (N. J.)	5.00	1,026	92	66	91⅝	+25
Sterling Drug	2.00[1]	387	39⅝	34	36⅛	− 1⅛
Sun Chemical	0.60[1]	324	11⅝	8⅛	10⅝	+ 2
Texas Co.	4.00[1]	90,615	82½	50¼	82¼	+21⅞
Texas Gulf Sulphur	4.00[1]	34,419	97½	63⅝	95	+25⅝
Union Carbide	2.00[1]	1,632	55⅝	40⅛	55½	+10⅛
United Carbon	2.40	171	48	32¼	47⅝	+11⅝
U. S. Gypsum	4.00[1]	201	125	90¼	104½	− 9
U. S. Industrial Chem.	1.15	190	38⅛	22	37⅞	+13⅝
U. S. Rubber	3.00[1]	830	52⅝	37½	51½	+12⅞
Vick Chemical	1.20	208	28⅝	20⅞	24⅝	+ 2⅝
Victor Chemical	2.25	8,907	51⅝	39⅝	47	+ 1¼
Va.-Car. Chemical	....	516	11⅝	6⅝	10⅞	+ 3⅛
Viking Corp.	2.00[1]	58	37⅛	28	36	+ 3⅛
W. Va. Pulp & Paper	2.00[1]	112	78	44¼	76½	+25⅝

[1] Annual basis. [2] Plus stock dividend. [3] Payable in stock, estimated cash value on dividend date.
[4] Declared or paid after stock dividend or split up.

PRICES



CHEMICALS

Tags Were Changed

Last year's tremendous demand for chemicals—plus spiraling plant and labor costs—pushed most prices far beyond the levels that marked the "readjustment year of 1949." We're now paying almost 18 percent more for chemicals than we did in 1949. Where did these increases occur?

They came in all parts of the chemical industry. Benzene, sparked by shortages and the entry of the high-cost petroleum product, jumped 50 percent to reach 10c. a gallon. Up with it went phenol and a host of other benzene-derived chemicals.

Sulphur prices went up \$3 to \$4 per long ton; sulphuric acid naturally followed. This, in turn, yanked up a host of metallic sulphates. Carbon bisulphide also rose; higher cost sulphur contributed.

Alkalis—caustic, ash and chlorine—also climbed a few rungs on the price ladder. They set off another chain reaction that hiked the tags on chlorinated hydrocarbons and other compounds.

But the prize for the year's most interesting price story goes to the solvents. Here it is.

For Want of Molasses

Korea—and what has followed—stiffened prices for alcohol and solvents and jacked up demand to the point that by the end of the year it outstripped production. Now the industry is without a uniform price structure. So don't be surprised if allocation and price control return this year.

Early last year (while the alcohol price structure was settled) large buyers didn't believe the market was firm: (1) Cuba had a substantial inventory of molasses; (2) there was a good carryover of ethyl alcohol from 1949. These buyers gambled that when the new crop came in, the

Cubans would have to sell at distress prices. They freely—too freely—predicted that molasses would go for as low as 3 c. a gallon at East Coast points.

But the British outsmarted us. They bought, with Marshall Plan aid, some 4.2 million gallons of 190-proof alcohol and 70 million gallons of Cuban blackstrap molasses. The price was on a sliding scale, dependent on delivery.

The British sent over their tankers, quickly took all the alcohol and molasses. The Cubans were left with empty storage tanks—and an excellent trading position for the new crop. Our fermenters were left in a situation they didn't quite believe.

Meanwhile, the Cubans had been convinced that the real market for molasses in the United States was for cattle food rather than for industrial alcohol. One molasses broker bought a substantial quantity for cattle food; another bought at 5.5 c. on the island —but guaranteed not to deliver at East Coast ports at over 7.5 c.

By the end of March it became obvious that demand for ethyl alcohol would be higher than expected, that its price structure wouldn't hold firm much longer. Fermenters had trouble in getting molasses, even at higher prices. Alcohol prices were advanced.

Alcoholic Moral

Korea and its repercussions then hit the industry. Rubber Reserve received a mandate to operate all synthetic rubber plants on an all-out basis. This meant that butadiene-from-alcohol units would be reactivated. Demand for industrial alcohol shot up 100,000,000 gal. at one clip.

Since grain prices remained firm, cattle-food molasses advanced to 12 c. on the East Coast. Fermenters had to pay this price—so alcohol prices were upped again. By July it was plain that domestic output simply couldn't take care of both industry and Rubber Reserve needs.

So fermenters began to buy alcohol abroad. But Rubber Reserve came in at that point and snatched up over 100,000,000 gal. from the French. Salt in this wound was that industrial consumers themselves picked up several lots from Mexico and Scandinavia.

Fermenters still hoped that the carryover in sugar might result in high-test molasses. This hope was punctured when Commodity Credit Corp. bought large tonnages of sugar from the Cuban Institute of Sugar Stabilization.

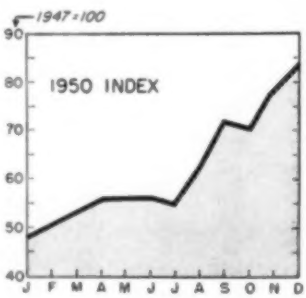
Meanwhile, synthetic alcohol producers were running their plants at full blast—but their entire output was committed. Even one faint hope—the new Fischer-Tropsch plant—fell down on the job by not performing as well as had been expected.

Only one course was now open to the fermenters: use grain. This naturally skyrocketed their raw material costs.

End of this little story: distillers' alcohol prices shot from 31.5 c. per a gal. at the beginning of 1950 to 85-90 c. at its last quarter. Moral: a little gambling on a lot of molasses can cause an awful mess.

Flying Lead

Prices of lead pigments joined the price of pig lead in an upward surge during the third quarter of 1950. Price of white lead rose 4½ c. to 18½ c. per lb. by the end of the year. Oxides showed similar gains. Other metals chalked up price gains during the second half of 1950. These gains were passed on to the metal salts in most cases and added to the spiraling price structure that built up in late 1950. Now the price freeze has nipped the trend. How much thawing will be permitted now is the big question.



OILS & FATS

Multiply by 2 or by 3

The price story on oils and fats can best be told by the graph. Index of these commodities started off the year at 48.19 (1947 = 100) one of the lowest points in recent years. This was caused by earlier cutbacks in production. However, oils and fats pushed upward steadily all year long; by the first of 1951 their index had reached 88.68—and was still climbing.

Price of cottonseed oil has doubled. The same is true of corn, soybean, menhaden and red oils, to mention only a few. Soap-lye glycerine prices have tripled in the past year, reflecting the terrific demand that placed it on the very first critical materials list issued this year.

Slipping By

Late last year, the government removed import controls on lard, tallow, oleo oil, palm oil, fatty acids and soap. Peanut oil, soybean oil, linseed oil, along with mixtures of vegetable oils and animal oils were kept under control.

In spite of these steps, price rises continued each month in this section of the CPI. When controls were finally imposed, the index had crept uphill another 5 points to 88.68. Final levels will depend on parity adjustments.

How Much Do Chemicals Cost?

	—Cents per Pound—	
	January 1950	January 1951
Chemical, 100 percent basis		
Acetic acid, glacial	7.5	10.5
Acetone	7.5	8.5
Aluminum sulphate	1.5	1.65
Ammonia, anhydrous	3.7	4.0
Ammonium sulphate	2.5	1.5 –2.25
Aniline	1.4	1.7
Arsenic, white	5.5	6.5
Benzene	3.01	4.00–5.02
Butyl alcohol, normal	1.2	1.1 –1.45
Carbon bisulphide	4.4	4.8
Carbon tetrachloride	8.0	7.5 –8.25
Caustic soda	3.05	3.35
Chlorine	2.4	2.7
Copper sulphate	7.25	9.0
Ethyl alcohol, SD-1	4.7	8.10–13.5
Ethylene glycol	14.5	17.0
Formaldehyde	9.45	10.4
Hydrochloric acid, 18°	3.2	5.2
Methanol	3.94	4.82
Nitric acid, 36°	9.55	9.55
Phenol	11.0	15.6
Salt cake	1.1	0.95
Soda ash	1.0	1.2
Sodium bichromate	9.75	10.75
Sodium phosphate, tribasic	3.75	4.15–5.30
Sulphur, crude	0.9	1.05–1.1
Sulphuric acid, 60°	0.985	1.05
White lead	14.74	18.5
Zinc oxide	11.0	16.0

Price List for Engineers

If you purchase in large quantities how much do you pay for your chemicals? This list shows prices in terms of pounds of contained chemical—not as prices generally quoted.

Want a Government Contract?

YOU WILL FIND IT EASY . . .

. . . IF you make the right product.
. . . IF you contact the right agency.
. . . IF you follow the right procedure.

JOHN KENT

The secret of selling to the government is in (1) finding the agency which buys the product offered and (2) making the offer in the exact manner and form prescribed by the procurement routine of that agency.

What generally complicates things is that many items are purchased independently by several departments and others are purchased by one agency for all departments.

Most government buying is on open competitive bidding and therefore the businessman should have his name on the lists of all agencies that buy the type of products he sells to make sure he gets invitations to bid.

The small businessman should remember that he can't sell his product by telephone or telegraph.

WHERE TO DO IT

The Federal Supply Service, a unit of the General Services Administration, is the general purchasing agency for the government. Its purchasing has recently been decentralized between New York and Chicago regional offices of the GSA. Chemicals and related products are bought in the New York regional office, located at 250 Hudson St.

After the chemical supplier establishes his firm on the regional office mailing list, he should also write to

Dir., Federal Supply Service, GSA
7th & D Streets, Southwest
Washington 25, D. C.

and place his name on the central mailing list maintained there.

The other major government buyer is the Defense Department. Buying is decentralized among the three services, and further delegated to the services' units such as the Army Quartermaster General, the Navy Bureau of Ships, etc.

JOHN KENT *of the McGraw-Hill Washington Bureau, fitted together this up-to-the-minute report on the topic-of-the-hour by calling on Washington's Procurement Brass. It's the latest word on the subject.*

All military supplies of oil, petroleum, lubricants and similar products are bought jointly for the Air Force, Army and Navy by the

Armed Services
Petroleum Purchasing Agency
Tempo 4 Building
Room 11005
Washington 25, D. C.

SELLING TO THE AIR FORCE

To sell to the Air Force, a small businessman's first steps should be to get on the mailing list. This is done by writing a letter to the

Commanding General,
Air Materiel Command
Wright-Patterson Air Force Base
Dayton, Ohio
Attention: Services Section
Procurement Division.

and asking to be put on list as registered bidder on the items mentioned in the letter.

The Air Force buys its "housekeeping items" locally through the Purchasing and Contracting Officer at each Air Force Base. These include cleaning chemicals, hardware, etc.

Businessmen would do well to get a copy of "A Guide for Selling to the Air Force" for sale by the Government Printing Office, Washington 25, D. C. at 15 c. It gives detailed instructions, lists of goods bought and their Air Force code numbers.

SELLING TO THE ARMY

The Army's buying is done through the so-called "technical services." Chemicals and related supplies are bought by the Army Quartermaster, The Chemical Corps, Ordnance Department, and the Corps of Engineers.

Chemicals and paints, detergents, disinfectants and related items are bought by the Army Quartermaster through the

New York Quartermaster
Purchasing Office
111 East 16 Street
New York 3, N. Y.

Paints and preservatives, special equipment oils, and related supplies are bought by the Ordnance Department through the

Raritan Arsenal
Metuchen, N. J.

Almost all supplies bought by the U. S. Army Chemical Corps are purchased through the

Commanding Officer
Chemical Corps Procurement
Army Chemical Center, Md.

Paints, chemicals and such items are bought by the Corps of Engineers through the

Chicago Procurement Office
U. S. Army Corps of Engineers
226 West Jackson Boulevard
Chicago 6, Ill.

The Army has prepared a pamphlet designed to assist the businessman in selling his products. It's called "How to Sell to the U. S. Army" and costs 30 c. at the Government Printing Office, Washington 25, D. C.

The principal purchasing office for the naval establishment is the Bureau of Supplies and Accounts. This office buys everything except food, lumber, petroleum products and medical supplies. (These are bought jointly with other services.) Potential suppliers should contact the

Bureau of Supplies and Accounts
Navy Department
Washington 25, D. C.

One of the greatest helps to the smaller businessman is the weekly summary of contract information issued jointly by the government agencies through the Field Service, Department of Commerce. This summary lists the items wanted and where further information is available. The summary may be seen at any of the 20-odd Commerce Department Field Offices located throughout the country.

For military purchasing information, the three services maintain a joint office in Washington. Write to:

Central Military Procurement
Information Office
Munitions Board
Pentagon
Washington 25, D. C.

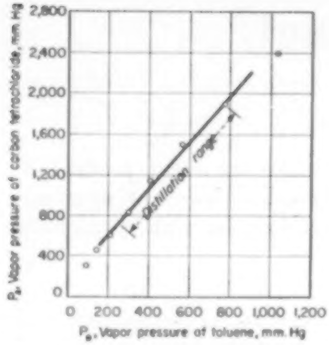


Fig. 1—Plot of P_A vs. P_B for an ideal system, carbon tetrachloride-toluene.

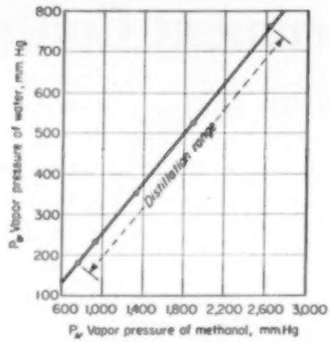


Fig. 2—Plot of P_A vs. P_B for a non-ideal non-azeotropic system, methanol-water.

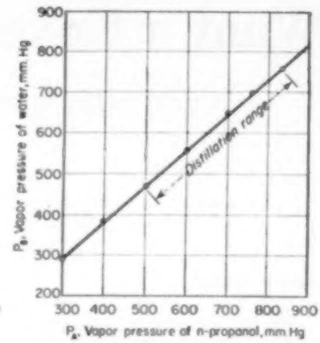


Fig. 3—Plot of P_A vs. P_B for a non-ideal azeotropic system, *n*-propanol-water.

How to Calculate Distillations With Variable Relative Volatility

Usual assumption that relative volatility is constant in distillation often leads to serious inaccuracies. The method given here permits calculations to be made with varying relative volatility.

MELVIN NORD

When it is desired to obtain analytical results in distillation problems it is customary to assume that the relative volatility is constant. Although this is approximately true in some cases, it is often so inaccurate as to be entirely inapplicable, especially with non-ideal solutions. Thus, with methanol-water at 1 atm., a non-ideal system which does not form an azeotrope, the relative volatility α varies from 2.5 to 7.6. In the azeotropic system *n*-propanol-water, α varies from 0.38 to 12.2. Consequently, the variation in α must be allowed for. The method given here does just this for simple batch distillation and equilibrium flash vaporization.

An equation for the "equilibrium vaporization constants"[2]

$$K_A = A K_B + B K_B^2 + C \qquad (1)$$

is applicable to ideal solutions, non-ideal solutions, and azeotropic systems. If there is no azeotrope $B = 0$, and Eq. (1) reduces to

$$K_A = A K_B + C \qquad (2)$$

If the relative volatility is constant, $C = 0$, and $A = \alpha$, and

$$K_A = \alpha K_B \qquad (3)$$

Eq. (3) can be theoretically derived from the Clausius-Clapeyron equation, assuming equal molal latent heats for each component.[1]

Melvin Nord is associate professor of chemical engineering at Wayne University, Detroit. Recent articles of his, in August and October 1950, have dealt respectively with graphical flow calculations and sonic precipitation of aerosols.

IDEAL SOLUTIONS

Applying Eq. (2) to an ideal solution gives

$$P_A = A P_B + C' \qquad (4)$$

which states that a plot of P_A vs. P_B for corresponding temperatures is linear, but does not necessarily pass through the origin. This resembles Duhring's Rule,[4] which states that a plot of T_A vs. T_B for corresponding pressures is linear, but does not necessarily pass through the origin. Since the temperature range of most distillations is small, it is not necessary to assume that Eq. (4) is correct over a wide range.

Figs. 1, 2 and 3 show the application of Eq. (4) to the systems carbon tetrachloride-toluene (an ideal system), methanol-water (a non-ideal, non-azeotropic system), and *n*-propanol-water (a non-ideal, azeotropic system.) Fig. 4 is a plot of K_A vs. K_B for the system methanol-water. It may be seen from this chart that although the assumption of constant relative volatility would be in very great error, Eq. (2) gives a reasonably

NOMENCLATURE

a, b, . . .	Mols of component A, B, . . . in still.
A, B, . . .	Constants.
F	Mols of feed.
K_A	Equilibrium vaporization constant.
K_z	$(z - y)/(z - x)$.
K'	Group defined in text.
$K_{1,2}$	Groups defined in text.
L	Mols of liquid.
P	Total pressure.
P_A	Vapor pressure of component A.
r	Fraction vaporized.
V	Mols of vapor.
x	Mol fraction in liquid phase.
x_f	Mol fraction in feed.
y	Mol fraction in vapor phase.
z	Azeotropic concentration.
α	Relative volatility.

Table I—Comparison of Calculated and Actual Values of y for Methanol-Water System (Eq. 2)

x	$y_{calc.}$	$y_{act.}$	y_{α}
0.000	0.000	0.000	0.000
0.020	0.138	0.134	0.081
0.040	0.235	0.230	0.153
0.060	0.308	0.304	0.217
0.080	0.365	0.365	0.273
0.100	0.411	0.418	0.325
0.150	0.500	0.517	0.433
0.200	0.561	0.579	0.519
0.300	0.653	0.665	0.649
0.400	0.721	0.729	0.743
0.500	0.777	0.779	0.812
0.600	0.828	0.825	0.867
0.700	0.874	0.870	0.911
0.800	0.918	0.915	0.947
0.900	0.960	0.958	0.974
0.950	0.980	0.979	0.987
1.000	1.000	1.000	1.000

good representation of the data — about as good as the assumption of constant α for ideal systems with equal molal heats. However, Eq. (2) fails in the case of azeotropic systems.

From Fig. 4 we see that the data for methanol-water may be represented to a first order of approximation by the equation $K_A = 12.3K_B - 3.9$ (Eq. 2), or $A = 12.3$ and $C = -3.9$. These values can be used to calculate y as a function of x; the results are tabulated in Table I. Also in this table are the values of y which would be calculated on the basis of a geometric mean value of $\alpha = 4.33$, showing that the assumption of constant relative volatility gives poor results while the use of Eq. (2) yields satisfactory results.

In applying Eq. (1) to an azeotropic system, the constants A, B, and C, are determined in the following manner. When $x = z$, $y = z$, and (where $(K_z)_z$ is the value of K_z at the azeotropic concentration):

$$1 = A + B(K_z)_z + C \tag{5}$$

This value must be obtained by extrapolation of values near the azeotrope. Combining Eqs. (5) and (1) gives

$$1/A = K_1 + (C/A)\ K_2 \tag{6}$$

where $K' = K_z/(K_z)_z$

$$\left.\begin{aligned} K_1 &= [(K_B - K')/(K_A - K')] \\ K_2 &= [(1 - K')/(K_A - K')] \end{aligned}\right\} \tag{7}$$

A plot of K_1 vs. K_2 should give a straight line, the slope and intercept determining the values of A and C. B is determined from Eq. (5).

A plot of K_1 vs. K_2 for n-propanol-water is given in Fig. 5. It is evident that K_2 is roughly linear with respect to K_1. The values of the constants in Eq. (1) are $A = -14$, $B = 36$ and $C = 5.7$.

Table II—Comparison of Calculated and Actual Values of y for *n*-Propanol-Water System (Eq. 1)

x	$y_{calc.}$	$y_{act.}$
0.000	0.000	0.000
0.010	0.110	0.163
0.020	0.216	0.233
0.040	0.320	0.300
0.060	0.351	0.328
0.100	0.372	0.358
0.200	0.392	0.383
0.300	0.404	0.403
0.400	0.424	0.424
0.432	0.432	0.432
0.500	0.452	0.452
0.600	0.492	0.494
0.700	0.551	0.553
0.800	0.641	0.642
0.850	0.704	0.704
0.900	0.778	0.778
1.000	1.000	1.000

Table II lists the results of calculations of y vs. x for n-propanol-water, using the constants just given. Thus, Eq. (1) gives a satisfactory fit to the experimental data. In the region where the slope of the equilibrium curve is varying very rapidly (i.e., where x is very small) the results are least accurate. However, in an actual distillation problem, it is not necessary to fit Eq. (1) to the entire range of compositions since the azeotropic concentration is never crossed. Thus it is possible to fit Eq. (1) to one side or the other of the azeotrope and it will, in general, be possible to obtain a closer fit over the smaller range of compositions.

SIMPLE BATCH DISTILLATION

Rayleigh's equation for simple batch distillation is[4]

$$\ln\frac{L_1}{L_2} = \int_{x_2}^{x_1} \frac{dy}{y - x} \tag{8}$$

Applying Eq. (1) and integrating gives

$$\ln\frac{L_1}{L_2} = \left(\frac{1}{A + B + C - 1}\right) \left(A \ln\frac{1 - x_2}{1 - x_1} + B \ln\frac{z - x_2}{z - x_1} + \ln\frac{x_1}{x_2}\right) \tag{9}$$

This is the integrated form of Rayleigh's equation for a binary mixture. If there is no azeotrope, use of Eq. (2) gives

$$\ln\frac{L_1}{L_2} = \left(\frac{1}{A + C - 1}\right) \left(A \ln\frac{1 - x_2}{1 - x_1} + \ln\frac{x_1}{x_2}\right) \tag{10}$$

If the relative volatility is constant, $B = 0$ and $A = \alpha$, so that

$$\ln\frac{L_1}{L_2} = \left(\frac{1}{\alpha - 1}\right) \left(\alpha \ln\frac{1 - x_2}{1 - x_1} + \ln\frac{x_1}{x_2}\right) \tag{11}$$

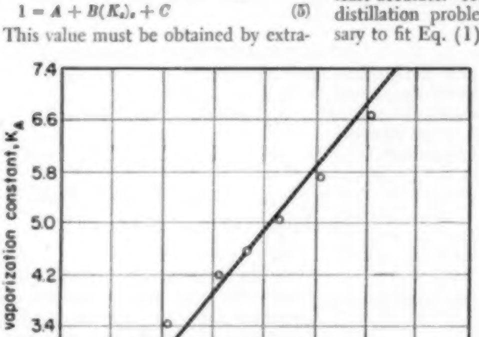


Fig. 4—Plot of K_A vs. K_B for methanol-water showing good result with Eq. (2).

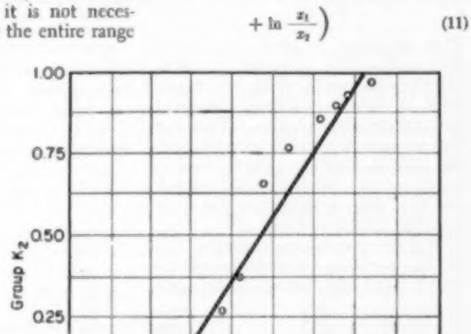


Fig. 5—Plot of groups K_1 vs. K_2 for *n*-propanol-water showing applicability of Eq. (6) to azeotropic mixtures.

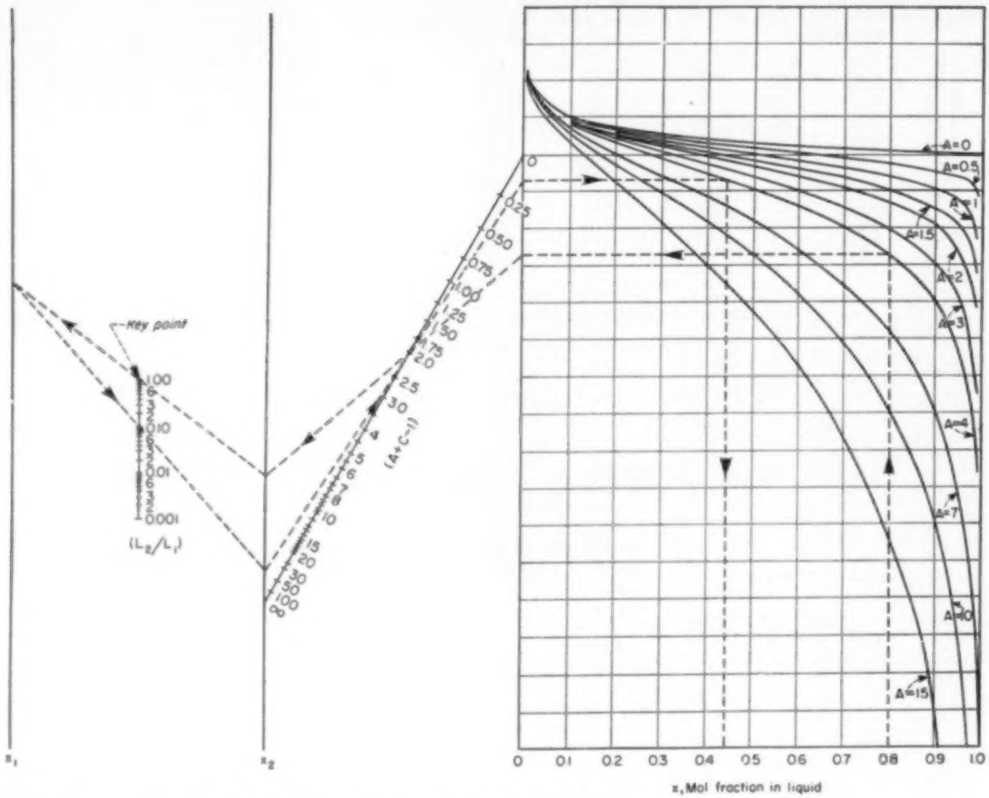


Fig. 6—Nomograph for solving Eq. (10) for simple batch distillations where there is variable relative volatility.

This equation is given by Perry.[4] The author has prepared a nomograph[8] based on Eq. (11), which permits its solution without requiring trial-and-error calculations. This can also be extended to the case of variable relative volatility (where there is no azeotrope), by using (10) instead of (11). Fig. 6 represents the nomographic solution of Eq. (10).

It is also possible to apply Eq. (2) to the problem of multicomponent simple batch distillation. In this case

$$\left.\begin{array}{l} -d_a = y_A\,(-dL) \\ -d_b = y_B\,(-dL) \\ \quad\text{etc.} \qquad \text{etc.} \end{array}\right\} \qquad (12)$$

where a, b, . . . are the number of mols of the component in the liquid. Combining Eqs. (12) and (2) and integrating we have

$$\left.\begin{array}{l} \ln\dfrac{a_2}{a_1} - A\ln\dfrac{b_1}{b_2} = C\ln\dfrac{L_2}{L_1} \\ \ln\dfrac{a_2}{a_1} - D\ln\dfrac{d_2}{d_1} = G\ln\dfrac{L_2}{L_1} \\ \quad\text{etc.} \qquad\quad \text{etc.} \qquad\quad \text{etc.} \end{array}\right\} \qquad (13)$$

Eqs. (13) together with

$$a + b + \ldots = L \qquad (14)$$

represent the solution to the problem. It is evident that when the relative volatilities are constant (i.e., when $C = G = \ldots = 0$), these equations reduce to the Lewis equations[6]

$$\left.\begin{array}{l} \ln\dfrac{a_2}{a_1} = A\ln\dfrac{b_2}{b_1} \\ \ln\dfrac{a_2}{a_1} = D\ln\dfrac{e_2}{e_1} \\ \quad\text{etc.} \qquad \text{etc.} \end{array}\right\} \qquad (15)$$

where A, D, . . . are the respective α's.

FLASH VAPORIZATION

The material balance for flash vaporization may be written as[7]

$$x_f = (1 - r)\,x + ry \qquad (16)$$

Combining Eq. (16) and (2) gives

$$x_f = x + \frac{rx\,(1 - x)\,(A + C - 1)}{1 + (A - 1)\,x} \qquad (17)$$

which can be solved by the quadratic formula knowing constants A and C.

In the case of multicomponent mixtures, Eq. (16) is written for each component and combined with Eq. (2) to give

$$\left.\begin{array}{l} \dfrac{x_{fA}}{x_A} - A\,\dfrac{x_{fB}}{x_B} = (1 - r)\,(1 - A) \\ \qquad\qquad\qquad\quad + Cr \\ \dfrac{x_{fA}}{x_A} - D\,\dfrac{x_{fD}}{x_D} = (1 - r)\,(1 - D) \\ \qquad\qquad\qquad\quad + Gr \\ \text{etc.} \qquad \text{etc.} \qquad \text{etc.} \qquad \text{etc.} \end{array}\right\} \qquad (18)$$

Eqs. (18) together with

$$x_A + x_B + x_C + \ldots = 1 \qquad (19)$$

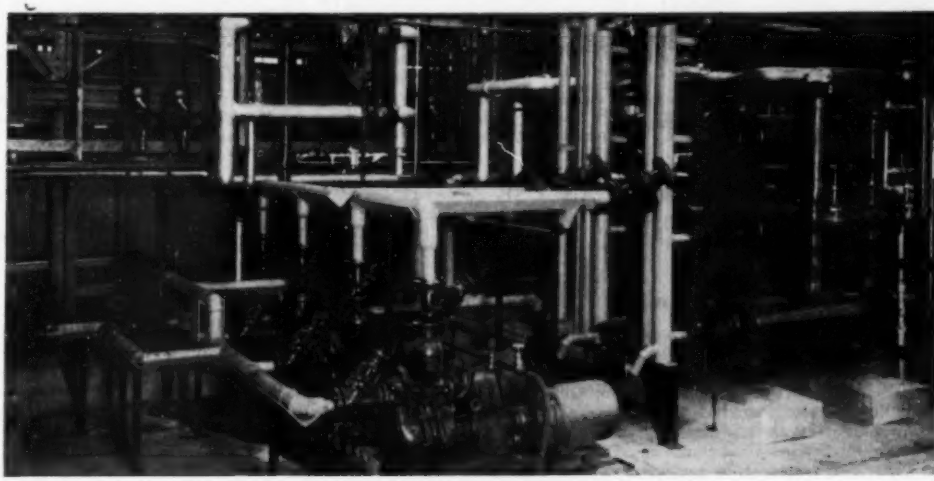
constitute the solution to the problem. When the relative volatilities are constant Eq. (19) becomes slightly simplified. The author has previously prepared a nomographic solution of Eq. (19) for the case of constant α.

References

1. Dodge, B. F., "Chemical Engineering Thermodynamics," p. 135, McGraw-Hill Book Co., Inc., New York (1944).
2. Ibid, p. 579.
3. Ibid, p. 249.
4. Perry, J. H., "Chemical Engineer's Handbook," 2nd Ed., p. 1383, McGraw-Hill Book Co., Inc., New York (1941).
5. Nord, M., *Ind. Eng. Chem.*, **39**, 232 (1947).
6. Perry, p. 1384.
7. Dodge, p. 599.
8. Nord, M., *Anal. Chem.*, **19**, 431 (1947).

DEPARTMENT OF THE MONTH. This department appears in each issue among the ads. Are you using it? To call it to your special attention we are starting it here this month.

The Corrosion Forum Edited by Morgan M. Hoover



VALVES, PUMPS, HEAT EXCHANGERS for electroplating solutions must be carefully chosen to beat . . .

Chromic Acid

NOTE: *Here you will find short articles on how various materials of construction stand up to chromic acid. This augments the articles in our November 1950 Materials of Construction report. Coming: citric acid, copper sulphate, ferric chloride, hydrocarbon solvents, phenol.* —EDITOR.

High-Silicon Irons

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

High-silicon iron alloys show very good resistance to chromic acid solutions at most concentrations and temperatures normally met.

In fact Duriron finds its most extensive application in electroplating, where it has the reputation of being the best alloy in the plating room. It is used for pumps, valves, heat exchangers, and fittings in chromium plating installations such as the one shown above.

Although the stainless steels and other alloys are apparently suitable for use in many electroplating installations, they are usually very prone to more corrosion due to stray electric currents. In this regard, Duriron is very much superior. However, hydrofluoric acid is sometimes present and when it is, Duriron should not be used. Small amounts of sulphuric acid in the common chrome plating solution do not alter its resistance.

Duriron is also good for handling chromic acid in industries other than electroplating. For instance, Duriron pumps are used in the production of various chrome pigments. Duriron pumps are also being used for handling a mixture of chromic acid, acetic acid and various solvents in a large chemical plant.

Durichlor provides no advantage over Duriron for handling chromic acid. The molybdenum containing Durichlor finds application in the presence of hydrochloric acid, moist chlorine and various corrosive chlorides and could only be considered an economical alloy in chromic acid solutions containing these corrosives.

Coatings

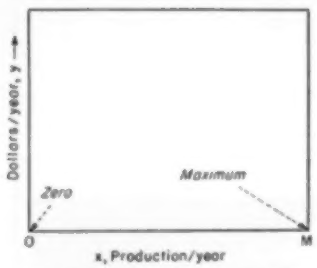
KENNETH TATOR, *Kenneth Tator Associates, Coraopolis, Pa.*

Since chromic acid is strongly oxidizing, certain organic coatings cannot be used. Those which can be considered: vinyl copolymers, polyethylene and its halogenated derivatives, polystyrene, and certain acrylic esters.

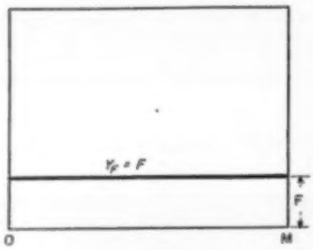
Almost all organic materials become slowly oxidized by prolonged exposure to chromic acid, however, so the thickest economically-practical coatings should be used (up to $\frac{3}{16}$ in. if possible). Slow oxidation of thin coatings will soon reach the metal causing blistering, loss of adhesion, or impairment of coating continuity over the entire lined surface.

Coatings are used even though chromic acid tends to passivate steel (the corrosion rate of a 24 percent solution at 120 deg. F. being less than 0.01 ipy.). Electroplating, for instance, will not permit iron contamination of the product. Often effective electrical insulation of the tank is needed.

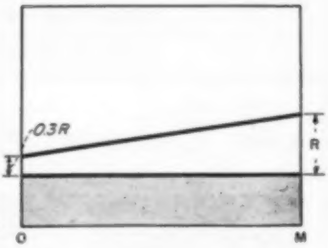
(*Continued on page 243*)



1. PRODUCTION, x, varies between zero and maximum. All costs are functions of x; y is function x.



2. FIXED charges, F, don't vary with production: depreciation, taxes, insurance and interest.



3. REGULATED expenses, R, are proportional to production: labor, maintenance, sales costs, etc.

NOW YOU CAN USE . . .

. . . Break-Even

R. D. NEWTON and R. S. ARIES

As any bookkeeper knows, three variables—production efficiency, total costs and selling price of the product—usually determine whether a plant stays in business or drowns in red ink. A big help to determining the interrelationships of these variables to a paying process has been the break-even chart.

If you want to know how much you'll have to sell an item for to break even at 78 percent of capacity production—or 60 percent or 90 percent—the break-even chart gives the answer. It'll also tell how to price the product for a desired return on the investment, considering costs and production. It'll tell whether you should shut your doors and write off an investment on a present process or whether a proposed process is financially sound.

Before we get into equation expansions, let's get a bird's-eye view of a break-even point. You'll remember from analytic geometry that the equation for the slope intercept form of a straight line is

$$Y = MX + B \tag{1}$$

You'll also remember that we can easily calculate the value of a point where two straight lines intersect. Now, on our chart, if we represent our total income by a straight line (Fig. 5), and our total operating costs by another straight line (Fig. 4), the point at which they intersect will be our break-even point. This is the point where costs just equal sales, (Fig. 5).

Let's take a concrete case. Suppose that our total income for a given product is \$20,000 at 100 percent production, \$0 at zero production (line through the origin). Our equation, then, is

$$y = (20{,}000/100)\,x$$

Our operating cost is \$8,000 at zero production and \$10,000 at 100 percent production. Our equation becomes

$$y = (10{,}000 - 8{,}000/100)\,x + 8{,}000$$

$$x = 44.4 \text{ percent capacity}$$

Or we will break even if our plant operates at 44 percent of capacity.

ROBERT D. NEWTON is a chemical engineer with Chas. Pfizer and Co. in Brooklyn. This is the first time his byline has appeared in Chemical Engineering. *ROBERT S. ARIES is a familiar name to readers. He directs the activities of his own company, R. S. Aries and Associates. One of his hobbies is designing Break-Even Charts.*

Now, for a more practical use of the equations, we simply expand them to include all of the variations of cost and production.

Referring to the cuts above, we see that the abscissa or x-coordinate is designated as production, runs from zero to maximum capacity, M. (Fig. 1). The ordinate, or y-coordinate equals costs. These are broken down into fixed (F), regulated (R), and variable (V), charges, (Figs. 2, 3, 4).

Experience has shown that regulated expenses to start production will run between one-quarter and one-third such costs at maximum capacity.[1,2] For purposes of this paper, a mean value of 0.3 was selected (Fig. 3).

Substituting these values in terms of capacity production, our equation for the straight line becomes

$$Y_C = MX + B$$

$$Y_C = \left(\frac{C - F - 0.3R}{M}\right) X + F + 0.3R \tag{2}$$

where C = total cost at maximum production; F = fixed cost at maximum production; R = regulated cost at maximum production; M = maximum production.

Total sales, as we have seen before, may likewise be expressed in terms of an equation of a straight line or

$$Y_S = M'X$$

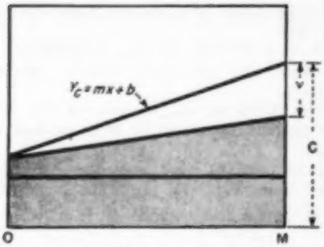
Substituting for the slope

$$Y_S = \frac{S}{M} X \tag{3}$$

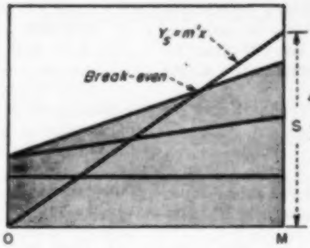
where S = the total sales at maximum production.

Above the maximum total cost, a profit, or return on the investment, comes into the picture. At first thought, it seems likely that the investment would remain constant even for zero production. Fact is, working capital is actually reduced in many cases as production drops. If this is the case, and we want to find the lower figure, it may be regarded as being equal to the working capital at maximum production multiplied by a ratio of the total costs at zero and maximum capacity.

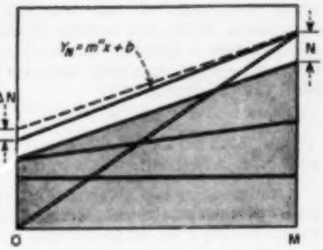
$$I_O = I_M\left(\frac{F + 0.3R}{C}\right)$$



4. VARIABLE costs, V, include only those directly proportional to production: raw materials, supplies.



5. SALES, (total) may be expressed as a straight line; $y = (S/M)x$, where S is tot. sales at max. prod.



6. RETURN at maximum capacity is N; Δ N is reduction in return due to lowered capital at zero prod.

Charts Without Fuss, Muss or Bother

where W_o = working capital at zero production; W_M = working capital at maximum production.

The total theoretical return at zero production must, therefore, be reduced by an amount equal to the difference between the working capital required at maximum and zero production, times the return on the investment.

$$\Delta W = W_M - W_M\left(\frac{F + 0.3R}{C}\right)$$

$$\Delta W = W_M\left(\frac{C - F - 0.3R}{C}\right)$$

$$\Delta N_O = W_M\left(\frac{C - F - 0.3R}{C}\right)P$$

where W = difference between working capital at maximum and zero production.

P = percent return on investment, expressed as decimal; N_o = reduction in return at zero production due to lowered working capital.

An equation representing the return thus takes the form of a straight line.

$$Y_N = M'' X + B''$$

Substituting we find

$$Y_N = \left[\frac{(C + N) - F + 0.3R + N - \left(\frac{C - F - 0.3R}{C}\right)W_M P}{M}\right]X + F + 0.3R + N - \left(\frac{C - F - 0.3R}{C}\right)W_M P \quad (4)$$

where N = the return at maximum capacity.

Further simplification and rearrangement yields

$$Y_N = \frac{(C + N)X + F + 0.3R + N - \left(\frac{C - F - 0.3R}{C}\right)W_M P(M - X)}{M} \quad (5)$$

WHAT IS YOUR BREAK-EVEN POINT?

We have shown above how to calculate your break-even point. With our expanded equations to allow for fixed and regulated costs, this becomes

$$X = \frac{(F + 0.3R)M}{S - C + F + 0.3R} \quad (6)$$

WHEN SHOULD YOU SHUT DOWN?

We might mention here that falling below the break-even point is *not* a signal to shut down. The shut-down point is realized when the difference between total cost and sales becomes greater than the fixed expenditures. Thus equating (2) and (3) and rearranging,

$$Y_C - Y_S = Y_F$$

Substituting from (2) and (3)

$$\left(\frac{C - F - 0.3R}{M}\right)X + F + 0.3R - \frac{SX}{M} = F$$

Rearranging

$$X = \frac{(0.3R)M}{S - C + F + 0.3R} \quad (7)$$

HOW MUCH SHOULD YOU CHARGE TO GIVE A DESIRED RETURN WHEN OPERATIONS ARE LESS THAN CAPACITY?

In order to determine the required sales price, S/M, to yield the desired percent return on the investment while operating at less than capacity production, the quantity y_s must be equated to y_N. Thus placing (3) equal to (5) and rearranging

$$\frac{S}{M} = \frac{C + N + \left[F + 0.3R + N - \left(\frac{C - F - 0.3R}{C}\right)W_M P\right]\left[\frac{M}{X} - 1\right]}{M} \quad (8)$$

HOW MUCH MUST YOU PRODUCE TO YIELD A DESIRED RETURN AT A SPECIFIC PRICE?

Rearranging (8), but maintaining the quantity S/M, the sales price, as an entity, the production level required to meet a desired return at a specified sales price is obtained

$$X = \frac{\left[F + 0.3R + N - \left(\frac{C - F - 0.3R}{C}\right)W_M P\right]M}{\frac{S}{M}(M) - C + F + 0.3R - \left(\frac{C - F - 0.3R}{C}\right)W_M P} \quad (9)$$

TOTAL INVESTMENT AT LESS THAN CAPACITY OPERATIONS

As stated before, the working capital may be decreased as production is lowered. Inasmuch as the difference between y_s and y_c represents the cash return, the investment may be expressed as

$$\frac{Y_N - Y_C}{P} = I$$

where I = investment.

By substituting Eqs. (2) and (5) into the above expression, and then rearranging, the investment may be determined for any level of production.

$$I = \frac{N}{P} - \left(\frac{C - F - 0.3R}{CM}\right) W_x (M - X) \tag{10}$$

That completes our equations. Now let's demonstrate their use with an illustrative problem.

Suppose that the management of your company is thinking about building a plant to manufacture a new product. The market research staff has estimated that sales of 500,000 gal. a mo. can be expected within three years of its introduction. They have suggested that the price should not exceed \$1.70 per gal., and that a price of \$1.30 per gal. would prove highly competitive in the present market. Total investment would be \$6 million. Management feels that a minimum return of 20 percent per yr. on the investment should be expected. Fixed charges have been estimated at \$50,000 per mo. on the proposed unit. Regulated expenses at capacity operation are expected to run \$200,000 per mo. Variable costs will be approximately \$0.60 per gal.

1. Let's find the production level necessary to break even if we take the \$1.30 per gal. sales price. Using Eq. (6):

F = \$50,000 per mo.
R = \$200,000 per mo.
M = 500,000 gal. per mo.
S = \$1.30 per gal. times 500,000 gal. per mo. = \$650,000 per mo.
$C = F + R + V$ = \$50,000 per mo. + \$200,000 per mo. + \$0.60 per gal. times 500,000 gal. = \$550,000 per mo.

Solving for x, our answer of 262,000 gal. per mo. tells us that this is the amount of product we must produce to keep out of the red.

2. Using the same price, at what level does the shutdown point occur? Using Eq. (7), our value for x tells us that we had better lock up our doors when production falls below 142,000 gal. per mo.

3. How much must we boost our sales price in order to realize a 20 percent return on our investment if production figures remain at the break-even level of 262,000 gal. per mo.? Eq. (8) is the one to use here:

N = (0.20) (\$6,000,000)/12 mo. per yr. = \$100,000 per mo.
W_x = \$700,000
P = 0.20 per yr./12 mo. per yr. = 0.0167 per mo.
X = 260,000 gal. per mo. at break-even point

Substituting in our equation and solving for x, we find that we must price our product at \$1.68 per gal. to yield the desired profit.

4. At what production level will the 20 percent yearly return be achieved employing a sales price of \$1.50 per gal.? Eq. (9) gives us our answer of 337,000 gal. per mo.

5. At this production level 4, and at the same percent return, how much will the total investment be? Using Eq. (10), our value for I is \$5,817,000.

These examples should point up the use of our equations to solve practical problems. Obviously, it is unnecessary to draw charts when solving problems.

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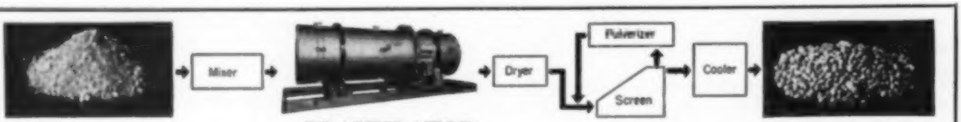


GRANULATOR

is the heart of an installation by Sturtevant for new fertilizer.

The only granulator fertilizer mixing plant in the country has been in operation since the first of the year. Its cost: \$130,000. Expected return on the investment: 100 percent in 12 mo.

Granular fertilizer, the plant's mainstay, is powdered fertilizer converted into granule or pelletized form of a predetermined size. First step in the process is sending powdered fertilizer from feed bin to mixer via elevator hopper. Thence to batch mixers, weighing belt, and "pug" mill where nitrogen solution and water are added. Then comes rolling the pellets in the granulator followed by drying and sifting on a 4-mesh screen. The screen scoots the oversized pellets back to the feeder. The other granules pass over a 2-mesh screen to get rid of the too-fine particles. They're picked up by dust collectors and re-circulated. The right sized granules go to the cooler and from there to the storage bins where they're ready for packaging.

The Des Moines plant of the Iowa Plant Food Co. does all this with the help of the Sturtevant rotary type granulator installation. By incorporating some new wrinkles to regulate the flow of powdered fertilizer the granulator is able to make uniform pellets of the desired size.

The ultra-modern plant has many features to boast. Among the more outstanding: production of 15 tons of granular fertilizer per hour with a crew of just five men; no hand shovelling or handling of material; overhead conveyor belts so arranged that the material may reach quickly any part of the 400-ft. building; loading or unloading from trucks or railway cars on either side of the plant, and many more.

This super processing adds up to a very superior product which, among other things is dustless; can be kept without caking, does not deteriorate. It allows the manufacturer to spread out operations instead of running 24 hours a day, two months a year, to meet heavy demands. Granular fertilizer can also be spread on windy days, is especially good for airplane distribution, and does not wash down below the roots as do pulverized fertilizers.

Process Labor Requirements

Here is the first in a series of new charts to help you predict operating costs for your proposed new plant. Coming charts will cover steam, electricity, and water requirements.

CECIL H. CHILTON

Direct labor occupies a prominent position on the cost sheet of almost every manufacturing operation. Other expenses related to labor also contribute materially to operating cost.

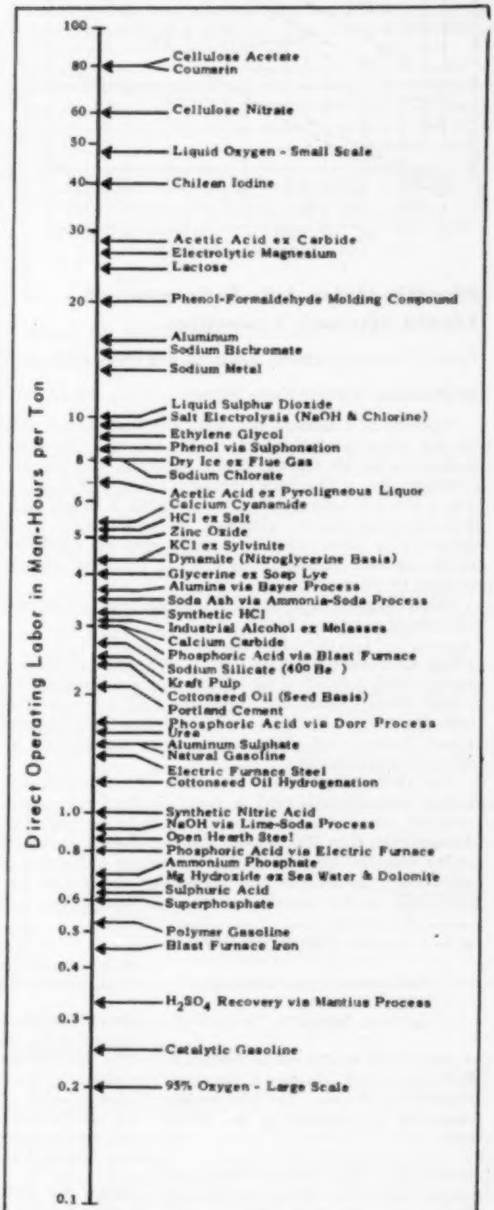
In addition to direct wages, the manufacturer pays social security taxes, disability and vacation benefits, pensions, and so on. These items are all functions of labor cost. The number of employees will influence the costs of supervision and, of course, timekeeping and payroll preparation. Costs of miscellaneous operating supplies, such as protective clothing, wiping towels, and sanitation chemicals, are closely connected with labor costs.

A large share of indirect expense, finally, is related to labor. The costs of providing parking facilities, locker rooms, cafeteria, telephone service, and many other of those numerous items entering into what we conveniently call "overhead" or "plant burden" are dependent on the size of the labor force. Even though some other overhead items, such as purchasing, factory office, and general superintendence, are not as intimately related to direct labor, many accountants find it expedient to apportion these overhead charges also on the basis of direct operating labor.

Any estimate of manufacturing cost, therefore, requires careful consideration of labor requirements. Yet the inexperienced engineer, faced with the task of making a cost estimate, finds himself handicapped by the lack of readily available reference data on labor costs for various operations.

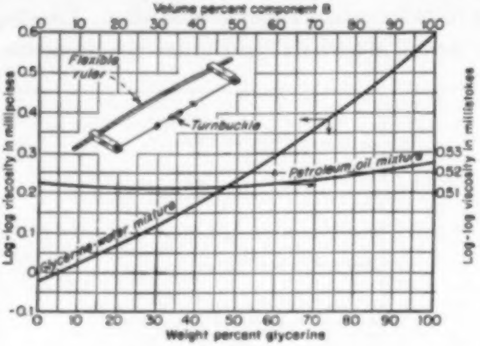
Chemical Engineering has in the past several years published a great deal of information on plant and equipment costs. Many engineers have told us that this information has been extremely valuable in the preparation of construction cost estimates. Recently there has been an expression of need for data which would assist in estimating operating costs. We are glad to make a start with the accompanying chart on labor requirements for various chemical processes, compiled from data available in the published literature.

Inasmuch as hourly wage rates are far from stable, the information presented here is expressed in terms of man-hours per ton, rather than in dollars. The three-cycle logarithmic scale emphasizes the wide spread over the range of products and processes listed. The specific figures given are typical, but may vary widely. For example, a large plant may employ only a very few more operators than a smaller plant making the same product. The estimator should bear this fact in mind when using the chart for a guide. If he is thinking in terms of production volumes much smaller or much larger than the typical commercial size plant for a particular product, the man-hour requirement should be adjusted accordingly. For firm estimates, of course, it will be necessary to synthesize labor requirements on the basis of job analyses. The chart in these cases can serve as a check on the magnitude of the result.



C. H. CHILTON *is an ex-Du Ponter who joined* Chemical Engineering *last December.*

The Plant Notebook Edited by Theodore R. Olive



Deviation of Curve for Glycerine-Water

Wt. Percent Glycerine	Log-Log Viscosity	Viscosity, Millipoises: Curve	Viscosity, Millipoises: Observed	Deviation, Percent
10	0.020	11.1	11.53	− 4
20	0.067	14.7	15.42	− 5
30	0.117	20.4	21.57	− 6
40	0.172	30.6	31.81	− 4
60	0.284	93.9	88.23	+ 6
70	0.362	200	179.6	+11
80	0.436	536	458.6	+17
90	0.514	1,845	1,636	+13

Deviation of Curve for Petroleum Mixture

Vol. Percent Component B	Log-Log Viscosity	Kin. Viscosity, Millistokes: Curve	Kin. Viscosity, Millistokes: Observed	Deviation, Percent
10	0.5139	1,841	1,813	+1.5
20	0.5130	1,811	1,798	+0.7
30	0.5127	1,808	1,793	+0.6
40	0.5130	1,811	1,810	.....
60	0.5146	1,863	1,870	−0.4
70	0.5163	1,919	1,930	−0.6
80	0.5187	2,004	2,003	.....
90	0.5213	2,094	2,100	−0.2

Flexible Ruler Aids Estimation of Liquid Mixture Viscosities

NIELS MADSEN, *Chemical Engineer, Elizabeth, N. J.*

★ December Contest Prize Winner

Viscosity of a mixture of liquids is dependent not only on the viscosity of the components and their amounts; it depends too on the size of the molecules and the relative strengths of the forces between them. For this reason it has not been possible to formulate a simple additive viscosity-function. However, for most binary liquid systems, the introduction of a single empirical coefficient in the viscosity equation will yield an equation accurate enough for most practical purposes.

Thus Cragoe[a] proposed the following equation for the viscosity of petroleum blends:

$$L_{1,2} = x_{w1} L_1 + x_{w2} L_2 + x_{w1} x_{w2} C$$

where x_w is the weight fraction, L a function of the viscosity, and C a constant for a given system calculated from a trial blend. With the introduction of this correction term the choice of viscosity-function is less restricted, and x may be expressed either as volume or mol fraction instead of weight fraction.

The above equation may be readily solved by means of a chart and a flexible ruler as shown in the figure. As an example consider a chart with an ordinate uniformly divided from 0 to 100 percent and the abscissa scaled off as the function $\log_{10}\log_{10}$ of the viscosity in millipoises or millistokes. A straight line connecting the points corresponding to the viscosities of the pure components will indicate the uncorrected viscosities of all possible mixtures, and the flexible ruler will very nearly correct for the deviations according to the last term of the Cragoe equation. This correction would be theoretically correct if the line connecting the two viscosities was horizontal, and if the point of maximum deflection corresponded with the 50 percent line on the chart.

It can be shown readily that, neglecting the longitudinal stress, the ruler may be considered as two cantilever beams with couples applied at the free ends. That being the case, analysis of the deflection produced shows the ruler to follow a parabola which is equivalent to the Cragoe correction term. This corrects for the interaction of molecules of the two different species, the resulting action being proportional to the probability of the molecules being near each other.

To draw the complete curve for a system, the viscosity of a mixture consisting of about equal amounts of the components is determined and plotted on the chart. The ruler is then adjusted by means of the turnbuckle until the point representing the viscosity of the mixture and the viscosities of the two pure components coincide with the ruler, care being taken that the center of the ruler is on the center line of the chart. After the adjustment has been made a curve representing all possible mixtures of the two components may be drawn.

The chart presented above shows such curves drawn for glycerine-water mixtures, and for a mixture of petroleum oils. For the first, Sheely (*Ind. Eng. Chem.*, **24**, 1060, 1932) shows the viscosity at 25 deg. C. as varying from

★ Next Month's Contest Prize Winner

"Overcoming Some Common Difficulties in Pipe and Valve Systems."

A prize of $50 in cash will be awarded to B. Hornung, of B. Hornung & Associates, Montevideo, Uruguay. The prize-winning entry will be published in the March issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the February winner will be announced in March and his article published in April. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

8.93 millipoises at 0 weight percent glycerine, through 50.41 at 50 percent and 9,450 at 100 percent glycerine. For a mixture of petroleum oils designated as System BH, Rahmes and Nelson (*Anal. Chem.*, **20**, 912, 1948) show the viscosity at 100 deg. F. as 1,879 millistokes for 0 volume percent of component *B*, 1,830 at 50 percent component *B*, and 2,212 millistokes at 100 percent component *B*. These data produce the two curves shown when used with the flexible ruler. Against observed data the glycerine curve shows a maximum deviation of 17 percent, which is not unexpected, since the presence of hydroxyl groups results in hydrogen bonding, thus influencing the viscosity. The petroleum mixture has components of almost equal viscosity and is also unusual in having a minimum viscosity. The ruler not only predicts the viscosities of mixtures with a maximum deviation of only 1.5 percent, but also locates the minimum.

The ruler may also be used in connection with viscosity blending charts such as those published by O. G. Wilson[3] or those adopted by the ASTM.[1]

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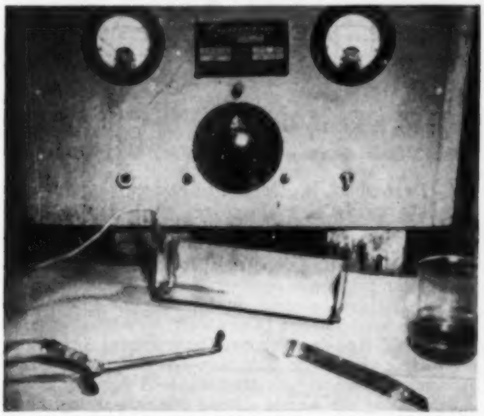


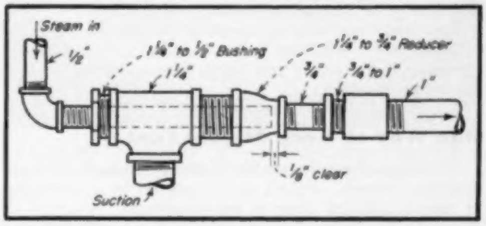
Simple Process Removes Discoloration From Welded Stainless Steel

Developed in the research department of Armco Steel Corp. is a new electrolytic method of removing the discoloration that results from welding stainless steel. It is particularly handy in hard-to-get-at interior corners.

The process consists in applying 6 to 12 volts d.c. to the discolored area through a mild acidic electrolyte. A small amount of acid solution, a copper rod as the electrode, the necessary connections, and a d.c. power source are all that is needed. The cleaning not only removes the discoloration but also passivates the cleaned area.

A ⅛-in. copper rod bent to suitable shape suffices for smaller areas. For larger areas a flat copper strip is preferred. In either case the copper must be insulated from contact with the metal. Short pieces of rubber tubing will accomplish this with rod, while acid-dampened asbestos or glass cloth works well with the strip. Phosphoric acid of 50 percent strength is the best electrolyte, other acids giving more etching action. The current strength should be 5-6 amp. per sq. in. of electrode in contact with the acid. A 6-volt battery will do for small work, but a 12-volt, 50-amp. rectifier is desirable for higher production or larger work. A low-capacity d.c. welder can be used for large welded structures, although it may be necessary to use resistors to reduce the voltage.

The copper rod is connected to the negative and the work to the positive terminals. Discoloration can be removed at about 2 lin. ft. per min. from corner welds. Since higher current densities give better cleaning, the acid should not be deeper than necessary, nor cover too wide an area.



How to Make an Ejector From Standard Pipe and Fittings

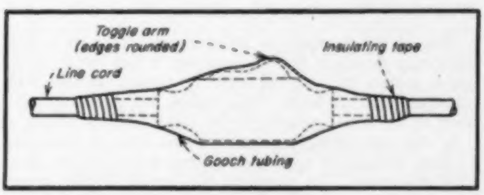
E. M. Milner and Charlie Grimsley, *Peninsular-Lurton Co., Helena, Ga.*

During a recent rainy spell it was necessary to empty the water which had collected in a blowcase pit, along with overflow pine gum, sand and trash. The simple and effective steam jet ejector shown here was devised and constructed from standard pipe and fittings to do the job.

Principal feature of the design is the use of a bushing as a sleeve-type coupling to insert the steam line into the ejector and still leave room for the liquid being pumped. Steam was chosen as a power source in this case because of the viscous nature of the pine gum and trash.

Head space between the steam jet and the reducer is not extremely critical, but can be adjusted to give best results by tightening or loosening the bushing or 1¼ in. nipple. In this installation the head space was between ⅛ and ¼ in.

When connected to a 50-psig. steam supply, this ejector pumped 800 gph. of water against a total head of 10 ft.



How to Spark-Proof a Cord Switch for Lab Use

Charles H. Grube, *Chemical Development Dept., Schering Corp., Bloomfield, N. J.*

In our laboratories, it is frequently necessary to stir flammable solvents in open vessels containing as much as 20 liters. For this purpose we have been using small, inclosed, shaded-pole induction motors which are non-sparking and are readily available. Outlet receptacles are

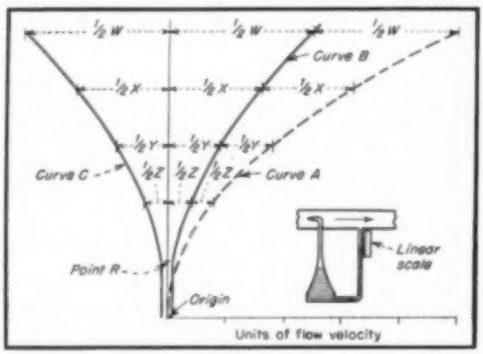
located away from the area as well. For proper control of the operation, however, it is necessary to have a switch nearby, even though flammable vapors may be present.

The simple device pictured here completely eliminates the danger of a spark at the switch igniting the batch contents. A simple, single-pole, single-throw cord switch is installed in the line and a sleeve of thin rubber Gooch tubing, obtainable from any laboratory supply house, is slipped over it. The tubing is cut long enough so that it extends about 1 in. beyond both ends of the switch. The ends are then taped securely over the rubber cord with insulating tape (we used Electrical Tape No. 33 supplied by the Minnesota Mining & Mfg. Co.).

The switch may now be operated through the sleeve in perfect safety. We have found the device very durable, especially if the rocker arm toggle is rounded off with a file before assembly.

One Way to Keep Motors Cool

Writing in the February 1951 issue of *Power*, T. H. Carr describes a simple solution to the problem of over-heating of motors installed close to hot equipment. A screen of fine-mesh wire is installed around the motor, with the end bells left uncovered for normal circulation. This intercepts radiant heat effectively.



How to Improve Readability of Pitot Tube Manometers

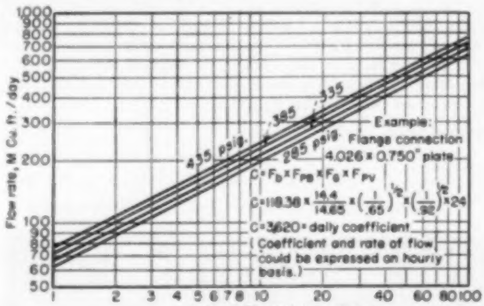
Walter G. Thomson, *Minneapolis, Minn.*

One of the troubles in using a pitot tube as a flow measuring device is that its response is not linear, being much greater for a given velocity change at low fluid velocities than at high. This makes the pitot tube difficult to use with accuracy in the upper velocity ranges.

In one case where a pitot tube was used in measuring air flow, because of space limitations, much trouble came from this cause. To overcome it a special U-tube manometer was constructed to give a linear characteristic curve. One leg of the glass manometer was of uniform bore, and the other was flared so that its diameter at any point was proportional to the square of its height. Therefore the height of the indicating fluid varied directly as the fluid velocity.

For a method of determining the shape of the flare graphically, the pitot tube characteristic (as measured by a regular manometer) is plotted as in curve *A* above. Points midway between the Y-axis and curve *A* are plotted as curve *B*, which is then duplicated as curve *C* on the other side of the Y-axis. Curves *B* and *C* now represent the desired boundaries of the flared tube, diameters being proportional to the heights above the origin. Actually, of course, in constructing the tube it is neither necessary nor possible to carry the curves to the origin. Instead, a length of straight tubing is attached at point *R*, which becomes the zero point. If the tubing is small, the error introduced will be negligible.

In use, the flared manometer is inverted, with the larger end at the bottom, connected to the other uniform leg of the manometer. The smaller end is connected to the impact tube of the pitot and the uniform leg is connected to the static pressure connection. The result will be a uniform linear scale which will be easy to read over its entire velocity range.



Simple Way to Graph Gas Flow Rates

C. J. Carmichael, Jr., *Chemical Engineer, Gulf Refining Co., Lafayette, La.*

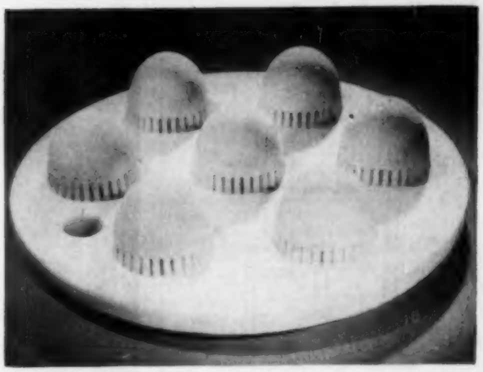
On logarithmic paper an exponential function plots a straight line with a slope equal to the exponent. Considering the pressure as constant, a graph for determining gas flow rates can be drawn quickly since the flow follows the exponential function $Q = CP^{1/2}h^{1/2} = Kh^{1/2}$.

The graph is made as follows: The coefficient corresponding to line and orifice plate size, specific gravity of the gas, pressure base, etc., is determined. A flow rate is calculated, using the average flowing pressure, at any differential. This point is plotted on two-cycle logarithmic paper, using gas flow rate and differential as ordinates. Through this point a straight line with a slope of 0.5 is drawn, which is the plot of the flow versus differential at the pressure used to calculate the original point. As a rule, the pressure varies enough to warrant the use of several constant pressure lines so that interpolation may be used, as in the chart above.

The chart shown is based on the following conditions: Flange connections, a 0.750-in. orifice plate, and $C = F_b \times F_{pb} \times F_g \times F_{pv}$, or $C = 118.38 \times 14.4/14.65 \times (1/0.65)^{1/2} \times (1/0.92)^{1/2} \times 24$, giving a daily coefficient of 3,620. The coefficient and flow rate could, of course, be expressed equally well on an hourly basis.

It should be noted that a 15-psi. pressure variation in a line carrying gas at 400 psig. would affect the flow by less than 2 percent, as indicated by $(400 + 14.7/415 + 14.7)^{1/2} = 0.98$. This approaches orifice meter accuracy. At higher pressures, larger pressure deviations would of course be allowable without exceeding 2 percent error. With the use of several constant pressure lines, each specified as to pressure, interpolation errors would therefore not be significant in field work.

Glass is the ideal construction material for many operations involving corrosive chemicals. Based on performance data reported here for a 6-in. diameter, 8-plate test model, you can now safely specify use of an . . .



ALL-GLASS COLUMNS can be assembled from plates such as this 24-in. diameter one. Caps are integral with the plate.

All-Glass Bubble-Cap Column

JULIAN C. SMITH and EVERETT F. KELM

Difficulties and cost of manufacture have discouraged, until recently, the use of glass bubble-cap columns for commercial fractional distillations. The development of new fabricating techniques, however, has made the manufacture of suitable equipment economically feasible. All-glass bubble-cap columns, 4 to 24 in. in diameter, and with integral bubble caps of conventional design, are now available.

To provide basic data on such columns, Cornell University studied the performance of a 6-in., 8-plate column, carrying one cap per plate. (Turn the page for details and dimensions of the experimental column.)

Slots in the caps were equally spaced, except that the two in direct line with the downcomers were omitted. There was no skirt clearance, each cap being integral with its plate. The downcomers were made of borosilicate glass tubing (Pyrex brand No. 7740); plates were high-silica glass (Vycor brand No. 7900). To allow for differential expansion between the plates and the downcomers, Teflon sleeves were used to hold the downcomers in place. Spool pieces were 8-in. lengths of flanged No. 7740 glass pipe, separated from the plates by asbestos gaskets. The column was assembled by use of external flanges and tie rods.

Tests were made with each of two binary systems: carbon tetrachloride (b.p. = 76.8 deg. C.) and benzene (b.p. = 80.1 deg. C.); and methyl cyclohexane (b.p. = 101 deg. C.) and toluene (b.p. = 110.8 deg. C.). Nitration-grade benzene and toluene and C.P. carbon tetrachloride were used without purification; their densities, refractive indexes, and boiling points agreed closely with published values for pure compounds. Commercial grade methyl cyclohexane from Phillips Petroleum Co. was distilled batchwise under high reflux through the test column, discarding the first 75 percent of product. The residue still contained a little low-boiling material, and was slightly less dense than pure methyl cyclohexane. It had a boiling range of 0.5 deg. C. Analyses of liquid compositions were based on indirect measurements of density. With mixtures of carbon tetrachloride and benzene, variations in composition as small as 0.05 per cent could readily be detected.

The boiler was normally charged with about 7 gal. of mixture, and the reflux surge tank was filled with material of the estimated composition of the reflux. After a heat-up period of 30 to 45 min., another hour was required before steady-state conditions were reached, as indicated by constant density of the reflux. Reflux was returned to the column about 5 deg. C. below its boiling point. Samples were taken of the reflux, the vapor entering the column, and the liquid returning to the boiler. In some runs samples of liquid and vapor were taken from individual plates. All samples were slowly withdrawn through ice-cooled copper tubes.

With high boilup rates, surging in the boiler was observed. This made it hard to measure the pressure drop accurately, and probably slightly increased the amount of entrainment.

At the end of each run the flow of condensate was diverted into a tared container, permitting a direct measurement of the rate of condensate flow. To measure pressure drop, manometer readings were taken with an air flow of a few bubbles per second through the manometer leads. The readings were quite reproducible.

Over-all plate efficiencies were plotted against average superficial vapor velocities. Vapor velocities were computed from the measured reflux rates, the computed amount of additional reflux formed at the top of the column in heating the added reflux to boiling, and the amount resulting from heat loss. The natural reflux caused by heat loss increased progressively down the column. At high rates of boilup it was a small part of the total, but at low boilup rates the vapor velocity dropped sharply from the bottom to the top of the column.

JULIAN C. SMITH *is associate professor of chemical engineering at Cornell University, Ithaca, N. Y.* EVERETT F. KELM *is employed by Corning Glass Works, Corning, N. Y., as senior product engineer.*

Details of the Experimental Equipment

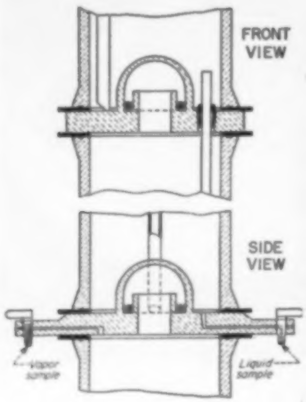
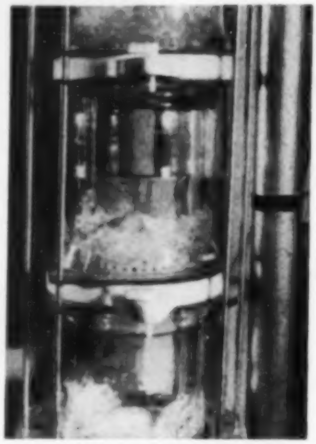
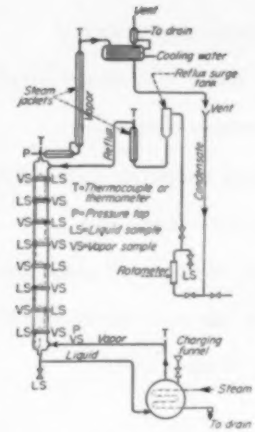


PLATE DETAILS are shown on two vertical planes: a front and a side view.



COLUMN ASSEMBLY can be visualized from this close-up photo.



EXPERIMENTAL COLUMN SETUP. Even the boiler was constructed of glass.

Table I—Significant Dimensions of Experimental Equipment

Column inside diameter = 6 in.	Number of slots per cap = 28	Static liquid seal = 1¼ in.
Number of plates = 8	Width of slots = ⅛ in.	Boiler dimensions = 12 in. diam. x 18 in. long
Plate thickness = 1 in.	Height of slots = ⅝ in.	Boiler heat transfer surface = 2.8 sq. ft.
Plate spacing, excluding thickness = 8¼ in.	Inside diameter of risers = 1⅛ in.	Vapor line to column = 1¼ in. I. P. S.
Caps per plate = 1	Height of riser above plate = 1 in.	Liquid return line to boiler = ⅜ in. I. P. S.
Cap diameter = 3⅛ in.	Inside diameter of downcomers = ½ in.	Vapor line to condenser = 1¼ in. I. P. S.
Cap height = 2⅝ in.	Height of downcomer above plate = 1¾ in.	Reflux line to column = ½ in. I. P. S.

Over-all efficiencies were taken simply as the number of theoretical plates divided by actual plates x 100. Theoretical plates were estimated from McCabe-Thiele diagrams based on the vapor-liquid equilibrium data of Rosanoff and Easley[6] for carbon tetrachloride-benzene, and of Quiggle and Fenske[4] for methyl cyclohexane-toluene. Since the vapor entering the column was directly analyzed, it was possible to estimate plate efficiencies without considering the boiler as one perfect plate. In most previous studies of this kind, this latter expedient has been necessary. Measurements of plate efficiency based on analysis of the boiler liquid are usually subject to appreciable error. This is due to fractionation in the vapor line between the boiler and the column. Thus two plate efficiency curves are shown for each system. Those based on the composition of the vapor entering the column give the best measurement of plate efficiency; those based on the liquid leaving the column are more nearly comparable with published results of other similar plate efficiency tests.

With the system carbon tetrachloride-benzene the overall plate efficiencies rose to a maximum of 65 to 70 percent at a vapor velocity of 0.5 ft. per sec., and then fell. At very low velocities the contact between vapor and liquid was not very good, but there was no liquid entrainment. This is shown by the results given in Table III for Run 3. The vapor rising to any plate was of the same composition as the liquid on that plate. As the vapor velocity increased the vapor-liquid contact improved and the efficiencies rose. At still higher rates of boilup there was visible entrainment of liquid from plate to plate. The over-all efficiencies dropped, and the liquid on any plate contained less of the low-boiler than did the vapor rising to that plate. Because of the short distance between plates, the range of permissible vapor velocities was small; entrainment became severe at velocities considerably below those used in plant-scale equipment. Maximum plate efficiencies at correspondingly low vapor velocities have been observed with close plate spacings with the system ethanol-water.[8]

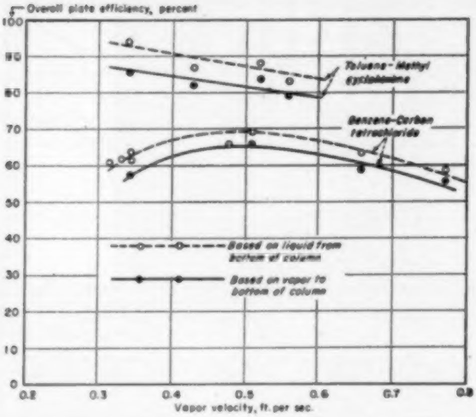
With methyl cyclohexane-toluene the over-all plate efficiencies were in the 80 to 90 percent range, but they fell with rising vapor velocity over the whole range of boilup rates used. Even at low vapor velocities there was considerable entrainment.

Since the viscosity of boiling mixtures of methyl cyclohexane and toluene is lower than that of carbon tetrachloride and benzene, over-all efficiencies should be higher. This would be in agreement with the published correlation between plate efficiency and viscosity.[3] The measured efficiencies bear out the predicted relationship. Efficiencies with the system methyl cyclohexane-toluene are a little higher than expected, possibly because of low-boiling material in the methyl cyclohexane.

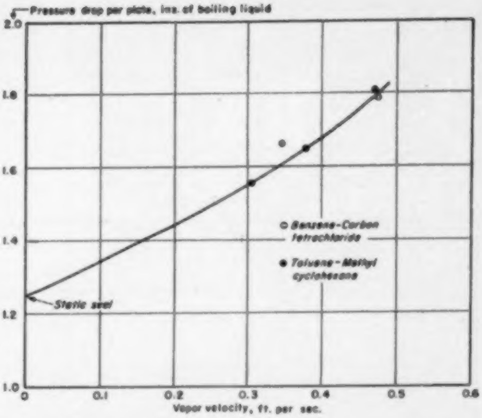
The observed efficiencies are higher than published values for large columns. This is in accord, however, with published results on small bubble-cap columns operating on systems having the same viscosities. Othmer[3] states that the efficiency of his 2-in. glass bubble-cap column was higher than that of full-scale columns. For a 1-in. glass bubble-cap column distilling carbon tetrachloride and benzene, Bruun[1] reports an average efficiency of 82 percent. The observed average with the 6-in. glass column was 62 percent. For a large plant-scale column the predicted efficiency, based on a liquid viscosity of 0.42 cp., would be 39 percent.

The individual plate efficiencies listed in Table III are somewhat erratic, because they are sensitive to

Results of the Performance Tests



OVER-ALL PLATE EFFICIENCIES were high, but typical of small-scale columns with close plate spacings.



PRESSURE DROPS for the two systems are brought into agreement by basing them on inches of boiling liquid.

small errors in analysis and sampling. They were computed on the basis of the change in liquid composition from one plate to the next, instead of on the usual Murphree basis of the change in vapor composition,[3] because vapor samples from two of the plates could not be obtained. The difference between the results computed by the two methods is not large. There was no consistent variation of plate efficiency along the column. The averages of the individual efficiencies were fairly close to the observed over-all plate efficiencies, although theoretically they need not agree.

For commercial use a glass column would normally be insulated. For purposes of demonstration and instruction, however, the test column was left bare. Heat losses from the column were appreciable, resulting in premature condensation of vapor within the column and affecting the apparent vapor velocity.

The magnitude of these losses was measured indirectly by making, with each system tested, a run with no externally added reflux, all the condensate being returned directly to the boiler. McCabe-Thiele diagrams were constructed from the analyses; the slope of the operating line was a measure of the amount of natural reflux at any point in the column. Low boilup rates were used to magnify the amount of enrichment.

Rates of heat loss, corresponding to twice the average reflux rate in the column, were 3,600 Btu. per hr. with carbon tetrachloride-benzene and 7,900 Btu. per hr. with methyl cyclohexane-toluene. These rates agree closely with predicted values for bare steel pipe under the same conditions.

Pressure drop across the column was 9 to 11 in. water with the system methyl cyclohexane-toluene, and about 16 in. water with equimolar mixtures of carbon tetrachloride and benzene. The measured pressure drops were plotted in inches of boiling liquid per plate. Expressed in this way, the results with the two systems were almost identical. The pressure drop rose exponentially with vapor velocity; at zero flow it corresponded to the static liquid seal of 1¼ in.

The all-glass column behaved very much as expected, with somewhat higher than usual plate efficiencies. In general its operation was very smooth; in the few cases when it did not work well the source of trouble could immediately be seen.

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3. Perry, J. H., "Chemical Engineers' Handbook", 3rd ed., 551, 613-4, McGraw-Hill Book Co., Inc., New York, 1950.
4. Quiggle, D., and Fenske, M. R., *J. Am. Chem. Soc.*, **59**, 1829 (1937).
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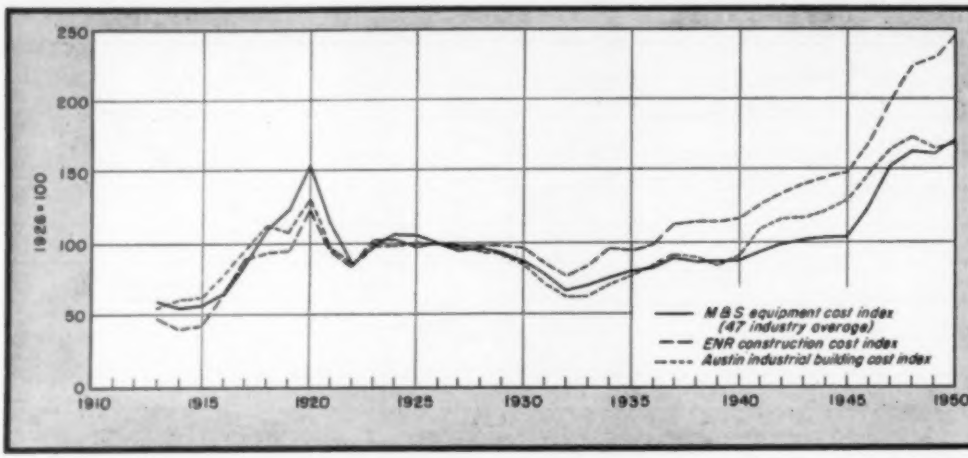
Table II—Over-All Plate Efficiencies With Total Reflux

Run	Average Vapor Velocity, Ft./Sec.	Mole % Low Boiler in — Liquid from Column	Vapor to Column	Reflux	Over-All Plate Eff., % — Based on Liquid from Column	Based on Vapor to Column
Series 1: Carbon Tetrachloride-Benzene						
1	0.316	39.9		57.0	60.9	
2	0.333	38.3		56.0	61.8	
3	0.345	45.4	47.9	62.6	63.5	57.3
4	0.347	48.8		64.2	61.3	
5	0.479	40.1		58.3	65.9	
6	0.512	33.2	34.1	53.4	69.0	65.9
7	0.650	12.6	13.6	29.4	63.1	58.9
8	0.774	12.1	12.8	27.3	58.6	55.3
Series 2: Methyl Cyclohexane-Toluene						
9	0.342	7.6	9.7	53.2	93.1	85.0
10	0.430	10.3	11.9	55.1	86.2	81.5
11	0.521	9.0	10.3	53.6	87.5	83.4
12	0.558	10.3	11.5	53.0	82.5	78.8

Table III—Individual Plate Efficiencies

	Run 3 Carbon Tetrachloride-Benzene			Run 7 Carbon Tetrachloride-Benzene			Run 11 Methyl Cyclohexane-Toluene		
Average vapor velocity, ft./sec.	0.345			0.650			0.521		
	Mole % Low-Boiler Liquid	Mole % Low-Boiler Vapor	Eff., %	Mole % Low-Boiler Liquid	Mole % Low-Boiler Vapor	Eff., %	Mole % Low-Boiler Liquid	Mole % Low-Boiler Vapor	Eff., %
Plate 1	47.9	47.9	54.3	13.4	13.6	64.3	8.8	9.0	55.7
2	49.8	49.8	44.1	15.2	15.6		11.0	11.4	98.4
3	51.3	51.3	58.8				15.4	15.5	73.8
4	53.3	53.3	63.6				19.9	19.9	87.1
5	55.4		61.3				26.0		92.4
6	57.3	57.3	70.0	22.5		63.9	32.3	33.4	113.7
7	59.3	59.4	55.2	24.8	25.0		41.0	42.0	92.8
8	60.9		60.7				47.4		97.1
Average			58.5			64.1			87.6
Over-all average			57.3			58.9			83.4



How Process Equipment Costs Varied

Tabulated below are the annual average indexes of comparative equipment cost for eight process industries and four related industries, prepared by the Chicago and Los Angeles evaluation engineering firm of Marshall and Stevens. Extending from 1913 through 1950, the annual averages are supplemented by a tabulation of quarterly figures at the right.

A tabulation in this form, giving quarterly data, appears each month on the first spread of our new equipment section, showing the latest revision for the quarter ending March, June, September or December. This feature was introduced initially on pages 124-6 of our November 1947 issue, in an article by the late R. W. Stevens, partner of the firm, which described the basis for the 47 industry indexes regularly issued by the firm, and the method of weighting of the process industry average.

Charted above is the M & S 47-industry average plotted on the same grid with the Austin Co.'s index of industrial building costs, and the *Engineering News-Record* index of heavy construction costs. Because the trend was sharply upward toward the end of 1950, the upturn for the year shown by the annual average is less marked than actually occurred.

Marshall and Stevens Indexes of Comparative Equipment Costs

(1926 = 100)

Industry	Dec. 1949	Sept. 1950	Dec. 1950
Average of all	159.4	171.5	177.1
Process Industries			
Cement mfg.	155.3	153.4	160.5
Chemical	163.3	171.4	177.5
Clay products	150.3	158.4	164.5
Glass mfg.	153.4	161.5	167.6
Paint mfg.	156.6	164.7	170.8
Paper mfg.	156.9	165.0	171.1
Petroleum ind.	159.7	167.8	173.9
Rubber ind.	162.1	170.2	176.3
Process ind. avg.	160.7	168.9	174.9
Related Industries			
Elec. power equip.	164.9	173.0	179.1
Mining, milling	164.0	172.1	178.2
Refrigerating	173.8	190.8	195.8
Steam power	152.0	160.1	166.7

Marshall and Stevens Annual Indexes of Comparative Equipment Costs, 1913 to 1950 (1926 = 100)

Industry	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
Average of all	57.9	54.1	55.9	62.6	81.5	100.7	122.0	153.3	115.5	85.5	97.5	105.3	106.3	100.0	98.0	96.5	91.0	87.0	78.9
Process Industries																			
Cement mfg.	58.0	55.0	55.0	62.5	80.4	109.1	118.4	149.2	112.6	83.7	96.9	104.6	104.7	100.0	98.5	97.2	92.5	87.0	76.8
Chemical	59.0	55.0	56.6	63.0	81.2	111.9	120.6	150.5	113.9	82.5	95.0	106.6	107.2	100.0	100.0	98.9	92.4	82.0	78.0
Clay products	60.7	56.7	58.1	65.3	84.6	120.0	128.8	154.3	116.6	82.9	96.6	105.7	105.8	100.0	96.5	97.0	91.7	86.1	78.0
Glass mfg.	58.7	54.5	56.2	65.5	85.5	112.1	131.9	151.1	114.7	83.7	96.2	101.9	104.5	100.0	96.2	95.9	92.1	86.6	77.9
Paint mfg.	58.2	55.2	55.8	62.8	80.0	106.0	119.8	148.5	116.3	84.1	95.8	104.0	103.4	100.0	94.1	94.6	91.7	85.7	76.6
Paper mfg.	60.4	55.3	55.8	63.4	81.0	111.8	121.4	152.6	114.8	83.1	95.6	105.6	106.3	100.0	96.2	96.8	90.9	86.5	77.1
Petroleum ind.	58.9	55.1	56.6	64.1	83.2	113.0	122.1	151.5	116.4	83.7	96.3	106.0	108.0	100.0	96.5	97.1	93.0	86.2	77.6
Rubber	58.6	55.6	57.4	63.8	81.7	113.8	123.3	154.2	116.2	88.0	96.3	105.9	108.7	100.0	98.4	91.9	91.9	86.2	77.0
Related Industries																			
Elec. power equip.	59.1	55.2	56.7	64.2	83.1	114.2	126.6	152.2	116.0	83.6	96.2	106.0	104.9	100.0	96.2	96.9	91.8	86.1	78.1
Mining, milling	56.8	55.8	56.5	62.9	82.0	111.9	120.3	149.0	114.1	82.8	93.3	105.6	107.1	100.0	96.7	97.2	92.9	86.7	76.8
Refrigerating	59.3	56.3	57.1	65.2	83.2	113.5	122.9	153.5	116.7	83.9	96.5	96.1	109.9	100.0	96.3	97.0	92.0	86.4	75.0
Steam power	60.1	56.2	56.5	64.3	83.1	114.3	127.6	152.2	115.7	82.7	96.3	106.1	108.0	100.0	98.4	96.9	91.8	86.2	80.1

Industry	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Average of all	66.1	69.4	74.6	78.0	81.6	88.3	84.4	84.8	86.6	92.6	96.6	100.5	102.4	103.4	123.2	150.6	162.6	161.2	167.9
Process Industries																			
Cement mfg.	66.9	70.7	75.7	75.1	82.3	88.8	85.2	84.6	85.4	90.5	97.8	98.3	96.6	99.4	119.7	144.3	156.5	156.6	161.6
Chemical	77.6	70.9	75.4	75.5	82.5	86.3	84.4	83.5	84.6	93.3	102.0	103.1	105.6	106.5	128.5	151.5	164.5	164.5	169.6
Clay products	70.6	71.1	75.7	79.3	83.3	87.8	88.2	82.7	83.7	87.6	93.1	93.6	93.9	94.8	115.0	139.8	151.5	151.5	156.6
Glass mfg.	69.4	71.2	75.4	78.5	82.6	88.0	83.4	83.0	84.3	88.2	93.7	94.7	96.5	97.4	117.6	143.3	154.6	154.6	159.7
Paint mfg.	71.7	70.1	74.6	77.2	81.5	87.4	83.9	83.9	84.9	90.3	97.3	98.3	100.1	101.0	121.2	146.0	157.8	157.8	162.9
Paper mfg.	67.2	69.9	75.4	78.5	82.7	88.1	84.8	84.1	85.1	90.5	97.5	98.7	101.3	103.2	122.4	147.0	158.1	158.1	163.2
Petroleum ind.	70.1	70.6	76.0	78.7	82.6	87.8	83.3	82.3	82.8	88.2	95.2	96.7	100.0	100.9	121.6	147.2	160.9	160.9	166.0
Rubber	67.1	70.7	75.2	78.1	82.2	88.4	85.4	85.3	86.3	94.2	102.7	103.7	105.5	106.4	126.6	151.2	163.3	163.3	168.4
Process ind., avg.	73.2	71.3	75.5	79.0	82.4	88.2	84.3	86.6	84.4	91.5	99.3	100.6	102.9	103.8	123.0	149.3	161.9	161.9	167.0
Related Industries																			
Elec. power equip.	70.1	70.7	75.5	78.7	82.7	87.9	84.3	84.1	85.8	90.5	96.5	97.5	99.3	100.2	122.9	150.0	166.1	166.1	171.2
Mining, milling	67.6	80.0	85.6	88.5	97.4	97.1	92.6	92.1	93.1	98.5	108.5	106.2	107.3	106.2	128.4	153.0	165.2	165.2	170.8
Refrigerating	70.0	71.3	75.4	78.9	85.0	87.5	83.0	83.1	83.1	89.0	95.5	97.0	100.1	101.7	125.7	162.2	176.7	175.6	185.2
Steam power	70.1	70.7	75.5	78.7	82.7	87.0	82.3	81.7	82.7	86.6	92.1	92.8	93.9	94.8	116.0	141.7	153.3	153.2	158.5

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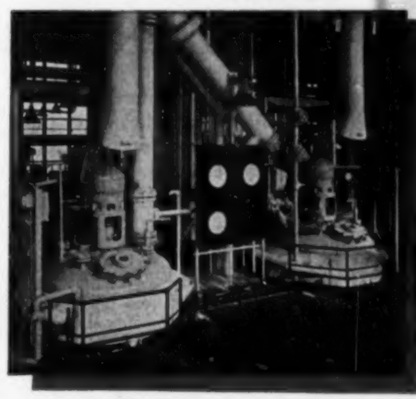

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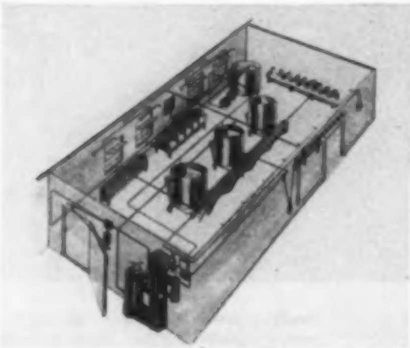
SAFETY



DRY CHEMICAL storage tank, nitrogen cylinder, and controls can be seen outside protected building. Small extinguisher at right is for fighting metal fires.

Fluidized Solids Find New Uses in Fire Protection

Dry chemical extinguishing agents can be employed in automatic fixed piping systems.

(*160A*) Automatic fire protection based on pipeline transport of fluidized solids is a new development of Ansul Chemical Co. This system resembles the usual water sprinkler system in the use of fixed piping and distribution heads and automatic actuation by rising temperature. But adapting such a system to the use of dry solid extinguishing agents called for more than a modicum of engineering development work.

The dry chemical—specially treated sodium bicarbonate—is fluidized with nitrogen under pressure sufficient to cause flow through the piping and distributor heads. How to protect the distributor heads from clogging presented a major problem. This was solved by providing the heads with protective caps which automatically blow off when the nitrogen pressure comes on.

When a fire starts, rising temperature causes air expansion in a heat-actuated device. This expansion exerts a pressure which is transmitted through a small copper tube to actuate the nitrogen cylinder release unit located at the dry chemical storage tank. A falling weight opens the exit valve of the nitrogen cylinder by means of gears. The released nitrogen pressurizes the main tank and forces the dry chemical out of the tank and into the distribution system.

Mounted on the side of the nitrogen cylinder release is an electric switch which is energized when a fire actuates the system. Thus, through direct connection of relays from this switch, other coordinated responses can be obtained, such as shutting down machinery, closing process valves, and even sending in an alarm to a central fire station. In all installations the system can be shifted at will from automatic to manual operation. Use of dry chemical is recommended for Class B (flammable liquid) and Class C (electrical equipment) fires. It is said to cut down the chances of a later reflash because it loses none of its effectiveness. In some instances where use of water may be objectionable for various reasons, dry chemical systems may be employed to protect hazards involving ordinary combustible materials.

In another announcement, Ansul reveals that Met-L-X dry powder can now be dispensed from a pressurized extinguisher. This extinguishing agent, not to be confused with the more common dry chemical discussed above, is effective on fires of magnesium, sodium, potassium, zinc, and powdered aluminum. It fuses and forms an air-excluding crust over the burning metal. Small particle size of Met-L-X is said to make possible its use in a gas-pressure type extinguisher.

These new extinguishers facilitate fighting metal fires at safe distances, minimizing danger of burns. They are manufactured in 30-, 150-, and 300-lb. sizes. All current production, however, has been placed on defense order allocation.

INSTEAD OF SPRINKLER HEADS:

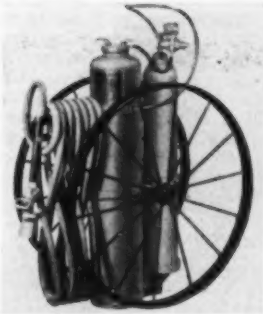
Fog Nozzle

(*160B*) A water fog producing device has been developed for use in fixed piping systems of fire protection by Fog Nozzle International. This device, known as the Foghed, is claimed to be superior to the ordinary type of sprinkler head in the control and extinguishment of fires involving oil, gasoline, and various chemicals. It is listed with Underwriters Laboratories for Class B and C hazards.

EASY LENS REPLACEMENTS:

Safety Goggles

(*160C*) American Optical Co. has announced improvements in the construction of two series of metal safety goggles. Temples now have brown tubing which cannot discolor and will outlast the life of the temple, according to the announcement. Lenses can be replaced without removing side shields.

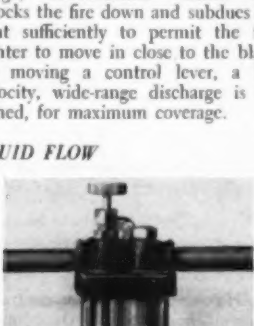


WITH ADJUSTABLE DISCHARGE PATTERN:
Wheeled Fire Extinguisher

(*161A*) Walter Kidde & Co. announces a wheeled dry chemical fire extinguisher with 150 lb. powder capacity, for combating flammable liquid and electrical fires. The new extinguisher is recommended for use against fires too severe or extensive for extinguishment with 20-lb. or 30-lb. portable dry chemical units.

Nitrogen is used to pressurize the dry chemical for discharge. A preset regulator maintains constant pressure within the dry chemical cylinder during discharge, and a safety valve prevents damage to the powder cylinder if the pressure should exceed that for which the regulator is set. The discharge nozzle can be set for a long-range, concentrated stream that knocks the fire down and subdues the heat sufficiently to permit the fire-fighter to move in close to the blaze. By moving a control lever, a low velocity, wide-range discharge is obtained, for maximum coverage.

FLUID FLOW

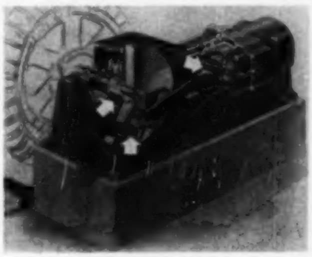


FOREVER BLOWING BUBBLES:
Sight Feed Bubbler

(*161B*) King Engineering Corp. has announced a new sight feed bubbler to control and indicate relatively small rates of gas or air flow. The rate of flow, shown by bubbles rising through liquid in a transparent cylinder, can be adjusted to less than 1 bubble per sec. or to as much as 20 cfh. through the needle valve at the top. Typical applications include bleeding air into lines to purge them of corrosive fumes, and use with hydrostatic liquid level gages to control and indicate the flow of compressed air required for continuous gaging.

A drain plug at the bottom permits easy removal of excess liquid built up by condensation of moisture in the gas or air. The cylinder is Pyrex glass or plastic, depending upon pressure requirements. All units are factory-tested at 100 psi. or higher. Inlets and outlets at the sides and rear give a choice of four piping connections.

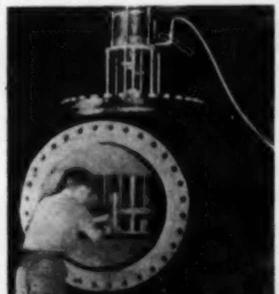
The dip tube is set off center and the bottom end is cut at an angle. Thus the bubbles all rise near the center of the bubbler and are readily observed without obstruction.



WITH ROLLER BEARINGS:
Horizontal Compressor

(*161C*) The Chicago Pneumatic Tool Co. claims to be the first manufacturer of horizontal-duplex compressors to utilize anti-friction roller bearings throughout instead of conventional sleeve type bearings. Spherical roller main bearings support the crankshaft and are also used at the crank pin end of the connecting rod; double-row needle bearings are used in the crankhead end of the connecting rod. Standard sizes are available in capacities of 350 to 10,000 cfm. for 80-125 psi. discharge pressure.

The advantages of anti-friction bearings have long been recognized by compressor design engineers. Their use, however, was impractical in side-crank type compressors, says CP, until the development of the oil-injection method of bearing removal. Removal and replacement of the crank disks or main bearings formerly required heavy, special equipment. Such parts can now be removed or remounted in the field with ordinary hand tools and a small, inexpensive hydraulic pump. Oil is injected between the bearing or crank disk and the tapered shaft through a passage drilled in the shaft. The oil pressure expands the inner bore of the part and the oil film reduces friction between the parts as the pressure separates the contacting surfaces. This friction loss and resultant axial component of force causes the bearing to pop off the shaft. Parts are installed in a reverse manner. After a part is positioned on the shaft the oil pressure is released and contact is restored.



BIG BUT FAST:
Control Valve

(*161D*) This 36-in. angle double-ported control valve, one of several recently constructed by Kieley & Mueller, is said to be the largest of its kind ever made. Despite their size, these valves had to fully open and fully close within 1 sec., and provide absolutely tight shut-off.

Installation requirements made it necessary for the valves to be on their sides, complicating the guiding problem for the valve plugs. The guide posts were equipped with roller bearings which permit low-friction movement of the plugs between open and closed positions.

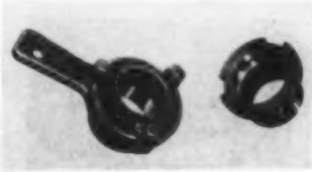
The valves are now giving satisfactory service in a large tonnage oxygen plant, according to K & M.

SEALED BY PRESSURE:
Cast-Steel Valves

(*161E*) William Powell Co. has made new improvements in the design of its cast-steel pressure seal valves. In this type of valve the internal pressure is used to obtain a tight seal between bonnet and body. This joint is constructed with a differential angle between gasket and bonnet in order to obtain line contact and realize therefrom a greater sealing force. *(Continued)*

One of the improvements is the use of a hardened stainless steel protective ring on top of the soft metallic gasket to prevent deformation of the top surface of the gasket. Another is the provision of lifting lugs on the yoke arms to facilitate handling the valve during erection and maintenance.

These valves are available in gate, non-return, check, globe, and angle patterns, for pressures to 2,500 psi. and greater.



QUARTER TURN DOES IT:

Quick Coupling Unit

(*162A*) A two-piece self-positioning quick coupling unit has been announced by Mead Cornell & Co. It can be opened or closed with a quarter turn in less than a second, it is said. The unit is available in aluminum, high-test bronze, stainless steel, and Ni-Resist, in sizes from ¼ to 6 in., inclusive. Standard couplings may be used up to 150 psi., while a high-pressure model may be obtained for pressures in excess of 2,000 psi.

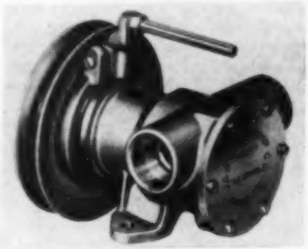
Gasket wear is claimed to be minimized because the flat tailpiece face is pressed straight against the gasket without twisting action and is locked to the gasket under pressure when the connection is made. The gasket is held in place at all times through the use of an undercut in the body.

FOR HEAT AND CORROSION:

Flexible Stainless Hose

(*162B*) Allied Metal Hose Co. has developed a new stainless steel corrugated flexible metal hose for use where problems of temperature and corrosion are severe. This hose is fabricated from thin-wall tubing and can be obtained in normal pitch for moderate flexing or close pitch for maximum flexing. It can be bent freely to a radius of from 5 to 41 in., depending on the size. For pressures up to 5,000 psi. the hose is covered with one or more tubular wire braids to supply added strength and prevent elongation.

Sizes range from ¼ in. to 4 in. I.D. and wall thickness is from 0.010 in. in the ¼ in. size to 0.035 in the 4-in. size. Stainless steel construction materials available are Types 304, 316, 347, 310, and Carpenter No. 20. Similar hose is also made in bronze, Monel, and other metals.



FOR V-BELT OPERATION:

Pump and Clutch Unit

(*162C*) The unit shown above, manufactured by Jabsco Pump Co., consists of a 1-in. pump with built-in friction cone type clutch for V-belt operation. It can be adapted for remote control by removing the lever and operating the unit by cable or electric solenoid.

NO STIFF JOINTS HERE:

Pipe Joint Sealer

(*162D*) West Chester Chemical Co. has developed a new joint sealing compound, Cyl-Seal, which is applied in liquid form to flanged or threaded pipe connections. It is said to change in the joint to a tough elastic solid with good resistance to vibration and corrosion, which never becomes hard or brittle. It contains no lead, graphite, oil, or flammable solvents, and is said to be resistant to most chemicals and solvents.

FOR ACTUATING CYLINDERS:

Pilot Valves

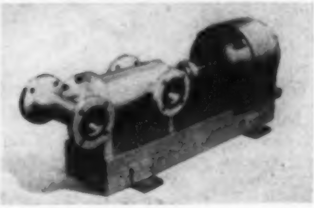
(*162E*) A line of valves for actuating air or hydraulic cylinders has been introduced by Ledeen Mfg. Co. They are made in three types: for hand operation, foot operation, and finger or solenoid operation. These valves are available in a number of different models and sizes and may be used for controlling the flow of air, oil, or water.

FOR RUGGED SERVICE:

Positive Displacement Pump

(*162F*) A new external gear and bearing bracket type screw pump for positive displacement of non-lubricating liquids of all viscosities at 1 to 700 gpm. is announced by the Sier-Bath Gear & Pump Co. New and improved features of this pump are said to provide greater durability, easier installation, and faster servicing. The new pump is available in horizontal or vertical construction, in corrosion-resistant alloys, and with steam-jacketed bodies and special stuffing boxes and bearings for high-temperature applications. It can be direct-connected up to 1,800 rpm.

PROCESSING



NO COOLING REQUIRED:

Disk Disperser

(*162G*) Announcement of a new disk disperser has been made by the Chaffee Design & Mfg. Co. This unit was developed for grease manufacturing but has potential application in other industries using emulsions.

The feed is forced under pressure through perforated plates. Between each pair of perforated plates, specially designed shearing knives revolve at a high speed. This combination of disks and knives provides shearing action instead of the usual tearing action and avoids generation of a large amount of frictional heat. For this reason, it is claimed, the Chaffee disperser does not require any cooling apparatus. Increased efficiency is reflected in the use of smaller motors than are customarily required in similar operations.

USES CATALYTIC COMBUSTION:

Fume Incinerator

(*162H*) Air pollution control by means of incineration of the offensive contaminants is facilitated by means of catalyst elements available from the Catalytic Combustion Corp. The catalyst elements have the appearance of metallic air filter mats. The construction is intended to provide a high catalyst surface exposure, turbulence in passage through the element, and reasonable minimum resistance to flow. The chemical union of oxygen and hydrocarbon vapors occurs without flame on the surface of the catalyst. To cause initial ignition of the fumes on the catalyst, an entry

(*Continued*)

See Louisville for
CREATIVE
DRYING
ENGINEERING

New Louisville Chemicals Dryer costs less, does 50% more work . . . at 77% less operating expense

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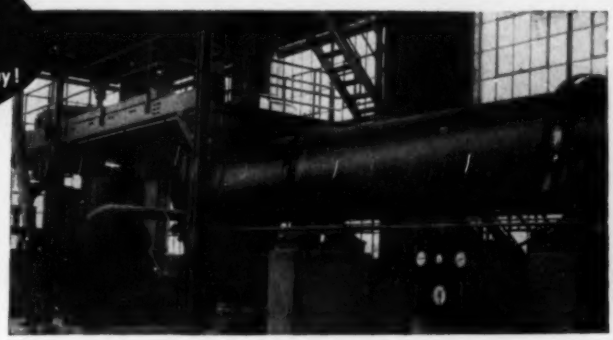

FORMER DRYER	
Installed cost	$40,000
Annual production (tons) . .	6,000
Drying cost per ton	3.72

(space required, 1500 sq. ft.)

LOUISVILLE DRYER	
Installed cost	$20,000
Annual production (tons) . .	9,000
Drying cost per ton	0.83

(space required, 500 sq. ft.)

YEARLY SAVINGS of LOUISVILLE DRYER in OPERATING COSTS ALONE $14,850

A magician's creation? No! The Louisville Dryer described here was installed by a chemical processor after his production was completely analyzed by a Louisville engineer. By using advanced, complete knowledge of drying processes, this dryer was especially designed to fit into his production line after the dryer's performance was pre-determined in our own unique research laboratories and pilot plant.

Without obligation ask a Louisville engineer to survey your drying methods. He may come up with a better solution that costs you less for faster, more satisfactory production.

Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Towers, Tanks, Bins, Filters, Kilns, Pressure Vessels

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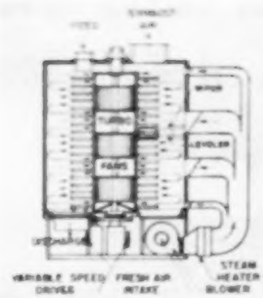
temperature of approximately 500 deg. F. is required, although this initial ignition temperature will vary, depending on the nature of the fumes. In any event, once catalytic combustion has been established, the process can be sustained thereafter with reduced air entry temperature.

Potential applications are in the incineration of fumes from paint and varnish baking ovens, solvent evaporation processes, chemical plants, oil refineries, and plastics manufacturing.



FOR SENSITIVE MATERIALS:
Turbo Dryer

(*164A*) To meet the demand for a Turbo dryer to handle heat-sensitive materials which have a tendency to foul heaters, the Wyssmont Co. has designed and built several units with external heating. In this type of installation the air is heated by an external steam-heating unit, as contrasted with the internal heaters of the standard design Turbo dryer.

The material is handled in the manner characteristic of the Turbo dryer. It is fed through an opening in the roof and is spread on the top rotating shelf which moves under the feed opening. Before the material revolves back to the point of the feed opening, it is wiped or plowed off the tray, falling onto the shelf below. The action is repeated on the second and consecutive shelves, resulting in repeated exposure of new drying surfaces and thus reducing the tendency for the material to caseharden or cake.

MORE POWER TO YOU:
Banbury Mixer

(*164B*) The size 11 Banbury mixer has been redesigned by Farrel-Birmingham to permit mixing stiffer stocks at higher speeds. The mixer was originally designed for a top horsepower of 250 at 20 rpm. This rating has been increased in three stages, and has now reached 800 hp. at 40 rpm.

WITH AUTOMATIC CUTOFF:
Heavy-Duty Mixer

(*164C*) A new model heavy-duty paste mixer of 50-, 100-, and 150-gal. capacity has been designed by Charles Ross & Son Co. Each unit has an individual right-angle gearhead motor directly connected to the agitator shaft, eliminating intermediate chains, gears, and clutches.

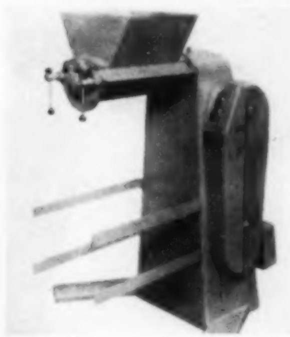
As a safety feature, the mixer incorporates an automatic cutoff which stops the agitator drive, without damage to the machine, should a bag or other foreign matter fall into the mixer. These new mixers are built of extra heavy construction to handle high viscosity batches. Mixing time is reported to be reduced by the use of greater pitch on the agitator and a faster shaft speed.

FOR EFFICIENT BACKWASHING:
Filter Membrane

(*164D*) A new type of filter membrane for its line of industrial filters has been developed by Titeflex, Inc. Designated as the Well-Screen, the new membrane is normally constructed of Type 316 ELC stainless steel wire formed to a screen of cylindrical shape. It is used within the filter to support the filter cake.

The wire of which the Well-Screen cylinder is made is formed with a triangular cross-section. This is said to eliminate clogging. Another advantage claimed is that in backwashing, these membranes achieve high efficiency because the backwash flow reaches its highest velocity at the exact point of support of the filter cake.

Well-Screen membranes, although developed specifically for use with Titeflex filters, can be utilized with various other types of filtration equipment. They are available in various sizes and can be provided in any alloy which can be drawn into wire.



RUNS IN OIL:
Oscillating Granulator

(*164E*) A new oscillating granulator of welded stainless steel construction is now available from F. J. Stokes Machine Co. Leakage of material is claimed to be practically eliminated in this new model. The part of the hopper which seats the screen has been provided with a longer and more accurate seat to prevent material working around the ends. Furthermore, there are screen end clamps to hold the screen tightly in place.

The gearing is of high strength and the entire drive mechanism is completely sealed in oil, resulting in quiet operation and longer life of parts. The motor is protected against dust and dirt by mounting it within the granulator housing with only the end exposed for ventilation.

FROM GERMANY:
Plastic Production Method

(*164F*) Savings in manufacturing costs of plastic products are predicted for a new German process by Charles A. Randorf, Inc., the American representative. The new process is claimed to make possible the economic

(Continued)

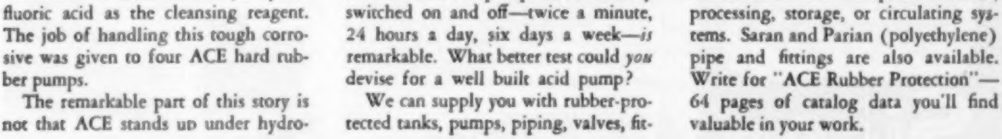
HYDROFLUORIC ACID EYEWASH

for Television Tubes – pumped by ACE Hard Rubber

This special machine for washing television tubes uses 12% hydrofluoric acid as the cleansing reagent. The job of handling this tough corrosive was given to four ACE hard rubber pumps.

The remarkable part of this story is not that ACE stands up under hydrofluoric acid; that's commonplace! But the fact that the pumps are constantly switched on and off—twice a minute, 24 hours a day, six days a week—*is* remarkable. What better test could *you* devise for a well built acid pump?

We can supply you with rubber-protected tanks, pumps, piping, valves, fittings, and utensils in standard or special constructions for complete chemical processing, storage, or circulating systems. Saran and Parian (polyethylene) pipe and fittings are also available. Write for "ACE Rubber Protection"—64 pages of catalog data you'll find valuable in your work.



mass production of seamless hollow products from rubber, thermoplastics, and cellulose derivatives.

The Holofol process involves a short chemical-physical treatment in a comparatively simple machine, which splits in half the thickness of sheets of a suitable material, leaving the edges joined. It is claimed that any forms or shapes pre-stamped or cut from sheets 0.05 mm. thick, and up, can be split by the Holofol process. The process is fully automatic and no mechanical fastening methods such as pasting, welding, or sewing are used in the treatment. Tubes, small tires, bottles, and bags are examples of articles which can be made by this method.

TAKING THE RAP:

Electrical Precipitators

(166A) Two new improvements in the design of Cottrell precipitators have been revealed by Research Corp. Since the collecting electrodes gradually accumulate appreciable layers of precipitated dust or ash, a good rapping system is necessary to keep them clean. The system used in the past was intermittent, the dust being shaken loose from the electrodes at periodic intervals. With this intermittent rapping, the plunger effect of large quantities of dust dropping into a hopper caused considerable dust reentrainment. The new improvement involves continuous or sequential rapping of electrodes, every minute or less, at a controlled vibrational intensity. This continuous rapping is described as converting precipitation from a batch operation to a continuous and uniform process. The new system, based on magnetic and electrical principles, is known as "magnetic impulse rapping."

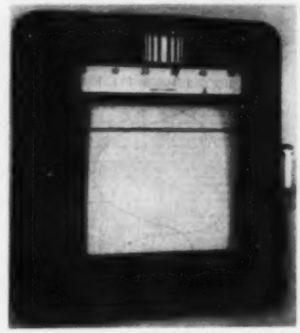
The second improvement is concerned with the supply of proper electrical energy to the precipitator. Research Corp. has designed a new system of energization providing automatic voltage control. This system is said to maintain voltages continuously and automatically at optimum values for maximum dust collection.

INSTRUMENTS

WHISTLES WHILE IT WORKS:

Low Pressure Alarm

(166B) A low-pressure warning device available from Airlarm whistles a shrill alarm when the pressure in any compressed air system falls below the minimum predetermined pressure for safe or efficient operation of equipment. A valve opens automatically when the air line pressure drops below a pre-selected value, allowing escaping air to blow a whistle which is an integral part of the unit. The alarm continues to sound as long as the pressure is below that for which the device is set and automatically stops when pressure is restored.



TWO INSTRUMENTS IN ONE:

Electronic Recorder

(166C) A new two-pen Speedomax electronic recorder announced by Leeds & Northrup Co. records two functions simultaneously and continuously. Separate measuring circuits, balancing motors, and recording pens are all housed in one standard case. Circuits can be supplied to work with thermocouples, strain gages, tachometers, pH cellls, or most other types of primary elements. The instrument can operate controls or alarms.

Recording pens operate overlapping or side-by-side, either across full scale or a specified portion of the full width. The instrument draws one curve in red ink, the other in black. Speed of response, chart speed, and scale ranges can be selected to suit the application. The same range can apply to both pens, or the ranges may be different.

QUANTITATIVE SNIFFER:

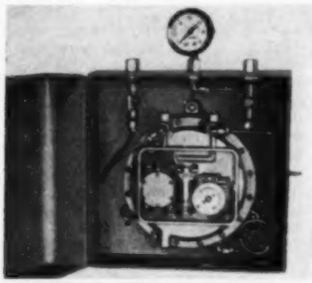
Air Pollution Test Unit

(166D) A convenient means for determining the concentration of gaseous and vaporous contaminants in air has recently been devised by the

W. B. Connor Engineering Corp. The unit operates on the principle of adsorption of contaminating vapors from a measured volume of air with activated carbon.

Two perforated canisters are assembled integrally with a motor-driven air blower. Contaminated air is drawn through a 0.7 in. thick layer of 6 to 14 mesh granular activated carbon at a linear velocity of 25 fpm. and a volumetric rate of 40 cfm.

The total volume of air that has passed through the carbon in any elapsed time is known. The impurities adsorbed by the carbon can be extracted for quantitative or qualitative examination.



INSURES ADEQUATE VENTILATION:
Velocity Controller

(167A) A new proportional-action controller for air velocities ranging from 50 to 250 fpm. has been developed by Johnson Service Co. It is designed primarily to control the velocity of air through the doors of laboratory fume hoods, where a fixed linear velocity is required through variable door openings of the hood. The new regulator measures the difference in pressure across the hood opening and operates through pneumatic control to maintain a velocity within ± 10 fpm. of the desired velocity, it is claimed.

The instrument employs a very light, flexible diaphragm, sensitive to pressure variations of 0.0001 in. water. The diaphragm responds to the pressure difference causing flow through the hood door and automatically takes into account which of the two pressures is higher. Proper control of the direction of flow, as well as the velocity, is assured. A circular dial permits adjustment of the desired controlled velocity.

CONCENTRATED INFORMATION:
Panel-Mounted Indicators

(167B) Bailey Meter Co. has introduced a new style of control panel instrument which permits con-

(Continued)

centration of vital operating information into a small space. These Mini-Line instruments, available in both indicating and controlling models, employ fixed vertical scales with swinging pointers. Multi-point indicators can be so grouped that the pointers follow a set pattern. In this arrangement, units for related factors are grouped together as one instrument, and scales may be selected so that all pointers fall into a horizontal or diagonal line when conditions are normal. If any one factor is not at the desired value it shows up "out of line."

Scales and pointers may be marked with fluorescent material and also illuminated with "black light" if desired. Annunciator lights to flash warnings in case of excessive or dangerous conditions may be incorporated in the standard units.

Also available is a control model which provides for remote manual or automatic operation of air-operated controls. It may include a set point adjusting knob for a distant controller or a bias adjusting knob for changing control relationships.

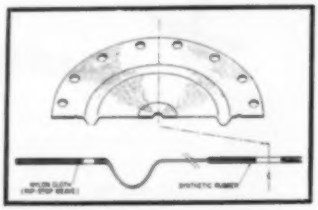
FOR FAST RESPONSE:

Non-Indicating Controller

(*168A*) Development of the Tri-Act, a force-balance, non-indicating controller for pneumatic transmission systems, has been announced by the Taylor Instrument Cos. The new controller supplements the recently announced Transaire temperature and pressure transmitters and the miniature Transet recording receivers. It can be located on the instrument panel or at the point of application.

A new control circuit is said to provide four times faster reset rate and four times faster rate action than conventional instruments. The ability to apply corrective action to the valve soon enough to prevent process conditions from overshooting or undershooting the set point is claimed.

Other features incorporated into this new controller are: A high-capacity relay air valve for faster output action; a self-sealing manifold for simplification of piping and maintenance; a non-rotating type needle valve for accurate duplication of response settings; and built-in orifice cleaners and air strainers. The Tri-Act can be used on temperature, pressure, flow, or liquid level applications.



NYLON SCORES AGAIN:

Valve Diaphragm

(*168B*) For use in gas pressure regulators in high-pressure service, the Rockwell Mfg. Co. has developed a new diaphragm of molded synthetic rubber strengthened with nylon fabric. The new diaphragm can be used in place of traditional flat leather or synthetic diaphragms.

The circular trough which lies between the case clamping ring and the diaphragm clamping plates is heat-molded in the shape of a torus. This permits the free area of the diaphragm to roll easily and smoothly, which, Rockwell claims, provides closer pressure regulation by reason of a more nearly constant effective diaphragm area. A special type of weave is used for the nylon fabric in order to prevent seepage of high-pressure gas along the fibers. The rubber composition is selected for its resistance to those fractions of hydrocarbons normally encountered in gas pressure regulator applications.

Although this new diaphragm is being initially applied only to pilot-loaded balanced valve regulators, it is planned to incorporate it in diaphragms for other types of regulators as soon as it becomes practically possible.

FOR HIGH PRESSURES:

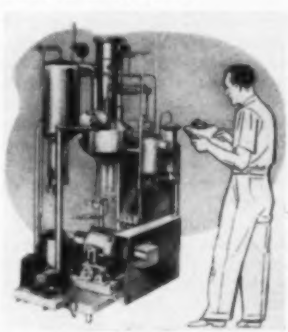
Positive-Displacement Meter

(*168C*) A new high-capacity positive-displacement meter capable of handling gas at pressures up to 1,000 psi. has been announced by Rockwell Mfg. Co. The announcement states that this is the first time that a diaphragm type meter has been available for use above 500 psi. Capacity of the meter is 31,000 cfh. at a pressure drop of 6 in. water or 46,000 cfh. at 10 in. water.

MOISTURE TESTER

(168D) **This new instrument gives direct moisture readings on a dial from 8.5 to 40 percent without mathematical calculations or reference to charts. Although the tester operates by electricity, it requires no electric outlets or batteries, according to the manufacturer, the Burrows Equipment Co. The instrument presumably operates in the same manner as a Megger for testing insulation resistance.**

HEATING & COOLING



FOR LOW TEMPERATURES:

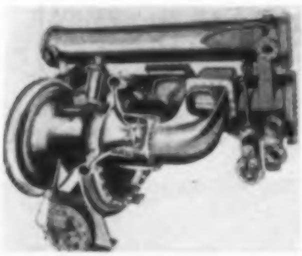
Laboratory Evaporator

(*168E*) Mojonnier Bros. is now manufacturing a low-temperature evaporator in laboratory size for use with research quantities of materials. These units can be used for low-temperature concentration of heat sensitive fluids, for low-temperature distillation and fractionation of solutions, and for experimental distillation of flavor extracts and essences.

(Continued)

About $\frac{1}{4}$ lb. of water per min. can be evaporated by the new unit. Small enough to fit through the typical laboratory doorway, it is ready to operate on delivery. The only installation necessary is connecting power and refrigerant lines.

As in the case of the company's production-size Lo-Temp evaporators, the laboratory model works on a heat pump principle, combining a single-effect vacuum evaporator with a refrigeration unit which provides both the heat for evaporation and cooling for the condenser. The principle has been described on p. 139 of our May 1950 issue.



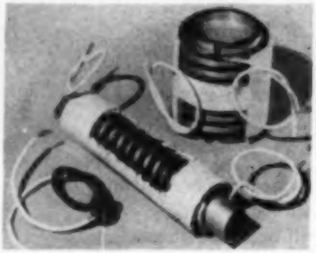
NEW CENTRIFUGAL COMPRESSOR:

Air Conditioning Equipment

(170A) Trane Co. is this month introducing several new air conditioning and heating lines. One of these is the Centravac hermetic-sealed centrifugal compressor and water chiller, designed to serve the 45 to 190-ton refrigeration range. According to the manufacturer, this machine will open new levels of operating and maintenance economy to an important segment of the market.

Because the Centravac's compressor-motor assembly is shipped hermetically sealed at the plant, bulk of installation work can be done by steamfitters and electricians, according to Trane. Contributing to operating economy is a capacity control system composed of variable vanes in the inlets of both low and high compression stages. This system is said to provide an almost constant ratio between cooling demand and power consumption through the normal operating range. The unit uses a Freon refrigerant, F-113.

In addition to the Centravac, Trane is announcing a new line of reciprocating compressors for use in the 50-ton range, and below. Other new items are a series of self-contained air conditioning units and a gas-fired duct heater.



IT'S HOT OUTSIDE:

Electric Heating Unit

(170B) Flexible heating units which can be applied to pipes, valves, cylinders, and containers can be obtained from the Titan Mfg Co. Sheathed in 5/16 in. diameter spring steel, the units are said to combine extreme flexibility and strength with a minimum bending radius of $\frac{1}{2}$ in.

Standard units are offered in lengths of from 1 ft. to 10 ft., in 1-ft. increments, for 115 or 220 v. Three types are available: 5 watts per lineal in., giving a sheath temperature of 475 deg. F. in free air; 10 watts, 650 deg. F.; and 15 watts, 700 deg. F. Other types with higher temperature ratings and longer lengths are made to specifications.

IN PREFABRICATED UNITS:

Cooling Towers

(170C) The Santa Fe Tank & Tower Co. has standardized production of the new Econotower, a compact water cooling tower designed for economical operation. Since the performance of these units is fairly standard in application, Santa Fe is producing the Econotower on a mass production scale. These units are completely prefabricated, ready for erection. They are recommended for small-capacity refrigeration and air conditioning systems.

APPLIED ULTRASONICS:

Boiler Scale Control

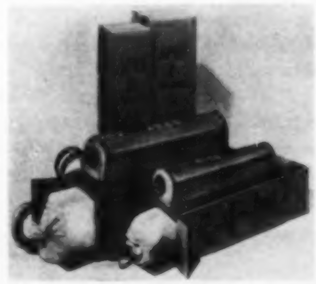
(170D) Velan Engineering Co. is marketing an ultrasonic wave-producing apparatus, known as Crustex, which is claimed to remove and prevent formation of limestone scale in boilers, water heaters, air conditioning plants, and industrial washing machines. A frequency of vibration of 27,000 oscillations per sec. is mechanically communicated to the liquid in the tube. These vibrations are said to maintain solids as separate particles and prevent them from adhering to the walls of the tube in the form of scale.

SOLO OR IN GROUPS:

Portable Electric Oven

(170E) A new portable industrial electric oven is now being produced by Grieve-Hendry Co. It is recommended for baking finishes, drying plastics granules, and for preheating molds. The ovens are so constructed that one may be nested on top of another. Even when used in groups, they can be operated as individual ovens, or selected ovens in the group can be cut out or heated at different temperatures.

CONSTRUCTION MATERIALS



PACKED IN DIRT:

Magnesium Anodes

(170F) Packaged magnesium anodes, produced by Apex Smelting Co., are available in either 17- or 32-lb. sizes, packed with a chemically-balanced backfill in a permeable cloth sack. These units are said to provide economy and convenience where it is desired to use the anodic method of protecting underground piping against corrosion. A 10-ft. insulated copper wire is attached to each anode and the complete unit is packed in a specially prepared shipping carton.

The special backfill is claimed to insure the longest possible installation life at the lowest possible cost. It eliminates the need for mixing backfill at the site.

In addition to the Anode-Pak units, Apex also produces 17-, 32-, and 51-lb. anodes in bare metal, with or without attached wires. The 51-lb. unit is designed for use under water and in coastal areas where more metal is needed to provide the desired protective life.

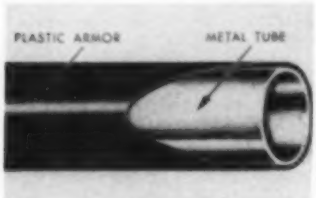
SAVE SILVER SOLDER:

Welding Fluxes

(170G) An expanded line of welding fluxes has been made available by Eutectic Welding Alloys Corp. Included in this new line is a

(Continued)

flux claimed to be capable of drastically reducing silver solder costs by cutting down on the amount used per weld. The new fluxes are designed to reduce surface tension to a greater extent than conventional materials used up to now.



FOR INSTRUMENT LINES:
Plastic-Coated Tubing

(*172A*) Samuel Moore & Co., manufacturer of Dekoron plastic-armored metal tubing, has made available a new service for plants using instrument tubing or fluid transmission lines subject to damp or corrosive atmospheres. The company now offers to extrude a coating of vinyl resin or polyethylene over customers' tubing. Tubing will be coated, before installation, in Moore's plant, which is prepared to coat copper, steel, or aluminum tubing either in straight lengths or in 50-ft. coils.

The company states that Dekoron is giving good results in a large chemical plant in the East. In one outdoor application, sulphuric acid forms on instrument lines and the air carries isopropanol sulphates. Ordinary steel tubing with 0.030 in. wall failed in less than a year, while Dekoron tubing made of vinyl chloride over copper is still in good condition after 2½ yr. service. In many cases Dekoron tubing has reportedly outlasted bare metal up to five times.

Dekoron tubing is made in sizes ranging from approximately ⅛ in. O.D. up to 3 in. or more. Thickness of the plastic armor can be varied from 0.015 in. up to practically any thickness required by the service conditions.

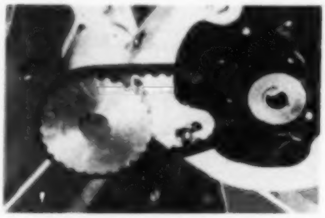
NO CURING REQUIRED:
Neoprene Coating

(*172B*) Gates Engineering Co. has announced a neoprene coating for routine plant maintenance use. According to the announcement, it can be easily applied without special equipment, training, or elaborate surface preparations. It does not require any primers or heat curing. One coat is usually sufficient for most applications, but for extreme duty, more than one coat can be applied with about 1 hr. drying time between coats. The coatings will conform to irregular surfaces, sharp points, right angles, bolt heads, and rivet lines, it is claimed.

ELECTRICAL & MECHANICAL

FOR HAZARDOUS LOCATIONS:
Explosion-Proof Switch

(*172C*) A newly designed heavy-duty factory-sealed tumbler switch in explosion-proof enclosure is now being manufactured by Russell & Stoll Co. The entire line has been designed to satisfy requirements for Class I, Groups C and D classifications. The unit includes tumbler switch with pigtail leads in factory-sealed housing, adjustable collar, and finishing cover.



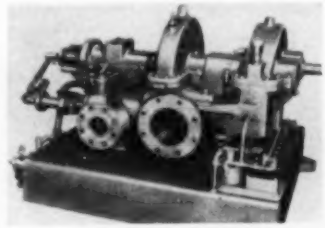
FOR SYNCHRONIZED DRIVES:
Toothed Rubber Belts

(*172D*) United States Rubber Co. has developed and started large-scale production of a rubber and fabric belt with teeth which it considers the most outstanding advancement in power transmission during the past 50 years. Known as the Gilmer timing belt, it provides a power drive which will not slip and which permits split-second precision timing.

The result of 12 years of research, the belt is similar in appearance to a flat belt except that it has regularly-spaced rubber teeth along its inner surface which engage corresponding grooves in the pulleys. It can be manufactured in any desired size and in a variety of materials to suit specific applications. Current production is limited to specifically engineered applications. However, the company expects to offer a standardized line of stock drives in both heavy and light-duty constructions with a sufficient number of pulleys to give an adequate range of speed ratios.

A steel cable element incorporated in the belt eliminates stretching. The belt will run quietly at speeds up to 16,000 fpm. over small pulleys and requires no lubrication or dressing. It is more sensitive to misalignment than V-belts or flat belts, but is claimed to be better than gears or chains in this regard.

The new belt has been tested in fan belt service by two automotive manufacturers and found to wear two to five times longer than V-belts, the manufacturer states. Development work is continuing so that broader application can be made with a minimum of individual job engineering.



WITH BUILT-IN SPEED REDUCER:
Geared Turbine Units

(*172E*) Westinghouse presents a line of close-coupled geared turbine units, combining the Type E turbine with a compact speed-reduction unit solidly coupled on a combination oil reservoir and base. Important features of these units are said to be dual over-speed protection, weather- and dirt-proof bearing seals, center-line support and free expansion, single helical gearing, and three-point support for ease in leveling and aligning.

Wheel sizes available are 16, 20, and 25 in. An ample range of standard gear ratios permits the Gearturbine to meet a variety of applications.

PACKAGING & HANDLING

FOR DAMP AND ACID CONDITIONS:
Plastic Film Packages

(*172F*) Blossom Mfg. Co. announces that it can supply barrel and drum covers, liners, pouches, and bags made of plastic film. The film is said to be durable, waterproof, and resistant to most acids. Articles can be made in any shape, form, and size to suit customers' specifications.

AIDS CAR LOADING:
Pallet Roller

(*172G*) The Ace pallet roller, manufactured by Frank L. Robinson Co., is designed to permit palletized loading of freight trucks and box cars without using a fork truck. A special model is available for loading refrigerator cars. These units are made in capacity ratings up to 4,000 lb.

(*Continued*)

FOR GREATER FLEXIBILITY:

Portable Car Unloader

(*174A*) Accessories have been developed by Barber-Greene Co. to adapt their Model 358 car unloader and Models 362 and 363 portable belt conveyors to handling bulk cement, sand, and other dry materials. This portable arrangement can be used in place of the customary type of permanent installation involving a screw conveyor and bucket elevator combination.

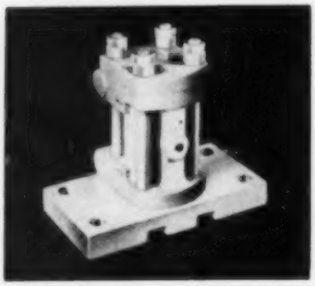
The unloader operates in a shallow pit beneath the rails. Collapsible canvas spouts with metal stiffeners are drawn up between the cross ties and attached to the hoppers of the car. The conveyor housing encloses the entire length of the belt, except for a small opening at the foot end. A concentrating spout is fitted at the head end to control escape of fines.

FULLY AUTOMATIC:

Valve-Bag Packer

(*174B*) A moderately priced valve-bag packer, the Auger-Matic, has been introduced by the E. D. Coddington Mfg. Co. Designed to fill valve bags with 25 to 100 lb. of any free-flowing substance this machine has push-button controls and is fully automatic. The operator slips a bag on the spout, presses a push-button to start the packer, and when contents of the bag reach a pre-set weight, the machine shuts off automatically. The operator then removes the bag and tucks in the valve ready for shipment to the customer.

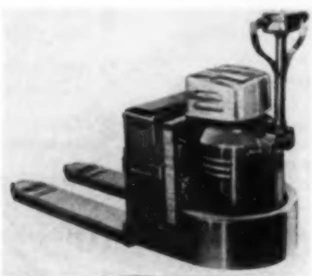
A multiple auger can be changed to fit the type of product being packed. Packers can be supplied with single speed or two-speed motors to meet varied requirements. They are stated to be adaptable also for filling barrels and open-mouth bags.



THE QUIET TYPE:

Bin Vibrator

(*174C*) A new type vibrator for use on bins, hoppers, and chutes is reported by the manufacturer, Cannon Vibrator Co., to operate quietly and with no metal-to-metal pounding. It is said to produce a greater, more intense, and more positive vibration than is possible with old-style impact-type vibrators. Sizes are available from 1¼ to 4 in. These vibrators can be interchanged with any bolted-type vibrator.



TWO-TON CAPACITY:

Electric Pallet Truck

(*174D*) Towmotor Corp. has announced a new and improved Model W electric pallet truck, built to handle pallet loads weighing up to 4,000 lb. Among the new and advanced features claimed by the manufacturer are a new contactor panel, a positive-action brake with foolproof dead-man control, improved differential action, and all-rubber dual trailer wheels for smoother operation

HANDLES LONG ITEMS:

Double Hook Hoist

(*174E*) A double hook hoisting unit complete with reversing motor, trolley, cable, and hooks is now being marketed by the Flinchbaugh Co. It is intended for handling long items in quantity, as shown in the illustration.

This hoist is rated at 500 lb. at 25 fpm., or 250 lb. at 50 fpm. Although hooks are normally spaced 48 in. apart, they can be adjusted for lesser distances, or units can be furnished with hooks up to any distance apart. Adjustable trolley wheels are designed to fit any size or make of track and travel any size curve.

FOAMING IS NO PROBLEM:

Barrel Filling Meter

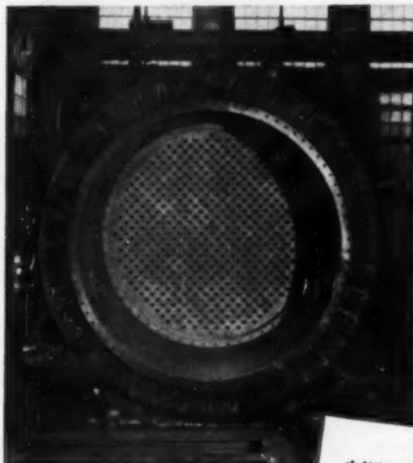
(*174F*) Production of a new 60-gpm. barrel filling meter is announced by the meter division of A. O. Smith Corp. This meter measures repeat quantities from 25 to 79 gal. by 1-gal. increments. Only a single gear change is necessary to obtain different quantity settings, according to the manufacturer. The meter is equipped with two counters, one registering the total meter throughput and the other indicating the number of containers filled.

Maximum flow rate is maintained by use of a slow-closing cam that controls the shut-off speed of the valve, thus minimizing foaming over of the

(Continued)

Let us help you get the right STAINLESS STEEL for your processing equipment

...it's more important than ever today!



Typical of the chemical processing equipment being built from Stainless Steel is this converter for the plastics industry, built by James Russell Engineering Works, Boston, Mass. The outside shell is 10 feet in diameter and 28 feet long. The catalyst chamber is 7 feet, 5 inches in diameter. This unit contains more than 500 cold drawn Stainless Steel seamless tubes and operates at about 1100°F.

NO single grade of Stainless Steel can serve as a cure-all for all the equipment problems of the chemical industry. Different materials, temperatures, corrosive conditions and methods of equipment fabrication dictate the use of a wide range of Stainless compositions.

With today's emphasis on uninterrupted production, it's more important than ever that your Stainless Steel equipment be fabricated from exactly the right composition . . . exactly the right size and form.

But these same conditions that put heavy demands on your production have affected supplies of Stainless Steel as well. Certain grades have been reserved entirely for defense orders; other grades are in restricted supply.*

So bring your Stainless problems to us; they'll receive the careful, competent attention they deserve.

*** What YOU can do to make the supply of Stainless Steel go further**

1. Tell your supplier the exact purpose the Stainless Steel is intended for and how you plan to fabricate it. Then you will get the *right* steel for the job.
2. Minimize your scrap losses by ordering the sizes that will cut to best advantage.
3. Indicate, if possible, acceptable alternates in composition, gage, size and finish . . . it may speed up deliveries to you.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND · COLUMBIA STEEL COMPANY, SAN FRANCISCO
NATIONAL TUBE COMPANY, PITTSBURGH · TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM · UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S STAINLESS STEEL

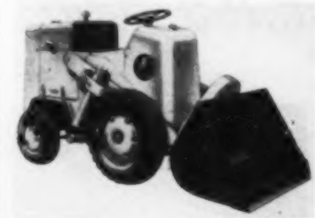
SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

1-319

UNITED STATES STEEL

product. This feature is adjustable to suit the foaming characteristics of the particular liquid involved. The 1½ in. filling nozzle is equipped with a light back-pressure valve which retains the product in the hose for maximum accuracy.

An optional accessory is an automatic temperature compensator which converts readings to 60 deg. F. The meter is also available with liter counters. Special meters to handle corrosive fluids can be obtained.



IMPROVED DESIGN:
Tractor Shovel

(176A) The improved Model HA Payloader, made by Frank G. Hough Co., features a new higher compression engine with more power and economy. In addition, the clutch is larger, operator's compartment is roomier and more comfortable, and main frame is longer. The manufacturer reports that maintenance operations are simplified by greater accessibility of engine and other parts.

USES PANTOGRAPH LINKAGE:
Fork Truck Device

(176B) The Clark Equipment Co.'s Pul-Pac, a fork truck device that handles unit loads without use of conventional pallets, is now being made with a pantograph linkage to actuate the gripper jaw and pusher rack, in place of the long piston rods employed on previous models. The new construction employs a shorter hydraulic stroke from a more powerful piston and eliminates the severe bending stresses to which the long pistons

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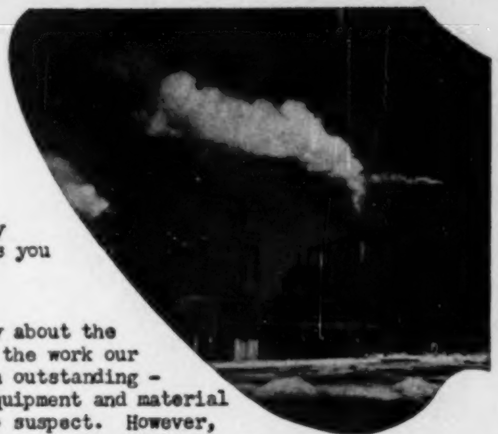
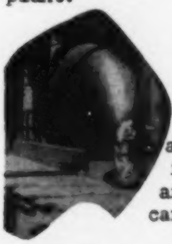


Dear Bill:

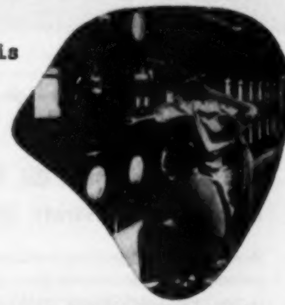
Thanks for your frank criticism. We try to say in our advertising a lot of the things you suggest. But some just can't be detailed.

For instance, we can't talk specifically about the cost of projects. I certainly do agree that the work our purchasing people have recently done has been outstanding - they really scurried around and are buying equipment and material at prices far under what we had any reason to suspect. However, although we often finish a job well under the estimate, obviously no client wants us to divulge specific cost information about his particular plant.



In our ads we sometimes speak of speed of completion and many of our projects are finished ahead of schedule with financial advantage to our clients in putting products on the market sooner. But, as you know, many factors affect a schedule and just plain speed doesn't always result in economy. There's no sense in sending a man out in the field to pour foundation if the stuff going on those foundations won't arrive for a couple of months. What we try to talk about is Badger's careful planning and coordination that produce savings in time and money.

Again, many times we develop new ideas in cooperation with a client's engineering staff, or adapt old ideas to new problems. The results are often immensely valuable to the client; yet to protect the client's interest we can't spell out our part in his success. Badger's fine reputation of ethical dealing is invaluable insurance to a client that his financial interests and industrial secrets will be protected, and is one of our most precious assets.



You ask why we don't emphasize more of our outstanding success stories, like those crude units which operated continuously for 796 days and processed 15,000,000 barrels without interruption. Well, we'd rather talk about our consistently good record than get into a bragging contest with our competitors.

Fundamentally we want to show how our broad experience in many varied fields is combined in one skilled, effective, integrated organization - and to emphasize Badger's basic know-how in the process industries.

Thanks for your letter though, Bill, and thanks for your other ideas which we will use during 1951.

E.B. Badger & Sons Co. est. 1841 a subsidiary of Stone & Webster, Inc.

Boston New York

Process Engineers & Constructors for the Petroleum, Chemical & Petro-Chemical Industries


JOB
PROVED

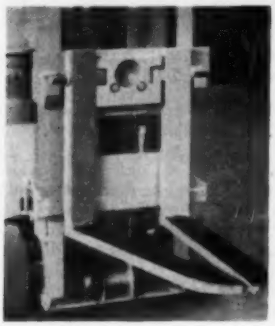
were subjected. Strong side forces formerly exerted on the long pistons are now absorbed by the pantograph. The new construction also contributes to maximum visibility and safety for the driver.

The new Pul-Pac can operate in less space than former models, it is said. The unit has a detachable mounting, and is interchangeable with standard forks up to 54-in. usable length.

FOR BULK MATERIALS:

Hydraulic Scoop

(179A) A hydraulic scoop accessory for attaching to Towmotor lift trucks can be obtained from the Towmotor Corp. It is designed to pick up, transport, and dump bulk materials such as coal, sand, cement, and scrap.



FOR CLOSE QUARTERS:

Pivoted Fork Tines

(179B) Vertically pivoted forks for use on high-lift power trucks have been developed by Elwell-Parker Electric Co. to meet requirements in factories, warehouses, and shipping departments where loads frequently are maneuvered in congested areas. The device is furnished as an integral part of some models of Elwell-Parker fork trucks or may be supplied as an attachment for standard models.

Each tine of the fork is adapted to swing inward from normal straight forward position, facilitating its entrance into a pallet or under a skid. The tines may be set so that their points almost come together in the form of a V, or so that one tine remains in normal position while the other is moved over far enough for the outer edge to touch it. With either adjustment it is not necessary for the truck and pallet to be in alignment before lifting or depositing a load, according to the manufacturer. The truck may approach and handle a load at an angle

(Continued)

of as much as 45 deg. from parallel, depending on length of tines and width of pallet.

All parts are made from forged alloy steels, machined for precision fit, and guaranteed against breakage up to full truck-load capacity.

MISCELLANEOUS

USES HIGH-PRESSURE STEAM:
Cleaning Unit

(*180A*) Livingstone Engineering Co. has brought out a new steam-jet cleaning unit, known as the Speedyjet. This unit can be used wherever an ample supply of steam is available at pressures in excess of 80 psi. It includes a pressure tank mounted on a light-weight dolly.

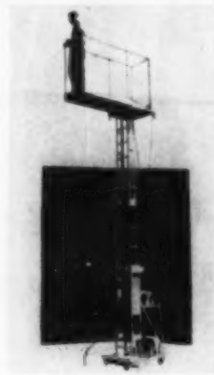
In operation, the tank is filled with detergent or solvent and steam is admitted to the tank to put the liquid under pressure. Detergent flows from

(*Continued*)

SILICONE LENS TISSUES

(180B) **Silicone-treated tissues for cleaning goggles and glasses in factories and offices are available for use with this wall dispenser. The tissues are made by the Silicone Paper Co. of America, using General Electric silicones. The tissues remove dust and dirt and leave an invisible coating of silicone on the lenses which is said to keep them cleaner, longer. The tissues are interfolded for dispensing in the same manner as paper towels.**

the tank through a hose to a lance, where it is atomized with steam and directed at high velocity, under fingertip control of the operator, against the object to be cleaned.



GOING UP:

Extension Scaffold

(182A) Atlas Industrial Corp. has announced a new extension scaffold designed for reaching high places over machinery. This unit starts as a 6-ft. ladder and extends to a height of 26 ft. Known as the Over-Reach, it can be operated by one man, and may be partially extended to any desired height. It has roller-bearing swivel casters on all four legs for easy maneuvering in tight places.

KARBATE PIPE ASSEMBLY:

Serrating Tool

(182B) National Carbon Div. now has available an improved hand serrating tool for use with Karbate pipe. Use of this tool is said to facilitate quick assembly of Karbate pipe at the job site. Pipe sizes from 1 in. to 6 in., inclusive, may be serrated.

WITH SPECIAL INSTALLATION TOOL:

Tube Sheet Packing

(182C) A new packing and packing installation tool, both special equipment for a new method of sealing tube sheet closures on heat transfer equipment, have been introduced by Greene, Tweed & Co. They are offered in a combination package called the Palmetto Tube-Seal. The new method of sealing is claimed to reduce considerably the high material and installation costs encountered on conventional seals where bolting or threading are involved. The packing is of molded composition and is available in compositions that match the service. —End

ANY TYPE OF VALVE

any place, any time, by any power-source available

CAN BE OPERATED BY *Limitorque*

- ✓ **INSTANTLY**
- ✓ **ACCURATELY**
- ✓ **SAFELY**
- ✓ **DEPENDABLY**

LimiTorque opens and closes valves of all makes and types up to 96" diameter by the "push of a button" from either remote or nearby control panels. Damage to stem, seat, disc, gate or plug is prevented because the Torque Seating Switch *limits the torque*, shuts off the motor if an obstruction occurs.

Greater safety is afforded workmen by LimiTorque Remote Control as it is unnecessary to go to high, low or dangerous locations for manual operation.

LimiTorque may be actuated by any available power source . . . electricity, steam, water, gas, oil or air.

LimiTorque Controls are obtainable through valve manufacturers. Thousands in daily use on land and sea . . . in Power Plants, Central Stations, Water Works, Refineries, and Oil Pipe Lines.

For full details . . . write for Catalog L-50 — please use your Business Letterhead.

Philadelphia Gear Works, INC.

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Industrial Gears and Speed Reducers
LimiTorque Valve Controls

High Temperature Lubricants

SILICONES are established.

FLUOROLUBRICANTS are moving up.

MOLYBDENUM lubes may be a dark horse.

(*184A*) These lubricants are an important tool of the chemical process industries. Here is a report on three of them.

SILICONES

Most important of the new synthetic lubricants, are characterized by heat stability, resistance to oxidation, chemical inertness, low volatility, high flash point, and water insolubility.

Fluids—They come in three types. Type A is a general duty lubricant for temperatures up to 500 deg. F. Used to lubricate things like conveyor bearings and oven machinery exposed to high temperatures. A rust inhibitor may be added where needed. Colloidal graphite may be suspended in the fluid for very high temperature lubrication.

Type B fluid is designed for use at temperatures ranging from −54 deg. F. to over 300 deg. F., light to medium loads. Does not gel or form gums after 1,000 hr. of use at 482 deg. F. Used for conveyor chains and lubrication of instruments.

Type C is useful mainly as a hydraulic fluid, available in viscosity grades ranging from 100 to 30,000 centistokes and higher. Very superior with regard to changes in viscosity at high temperatures. Tests by the Naval Research Laboratory showed no significant change in the viscosity of the silicone fluid after circulating continuously at 1,500 psi. for 500 hr. However, the fluid has very limited load carrying capacity where both loaded sliding surfaces are ferrous. Where either or both sliding surfaces can be replaced with another metal, results are excellent.

Other uses of fluid C: liquid dielectrics, mold release agents, waterproofing materials, and special-purpose lubricants.

Greases—Silicone greases are available in four grades. Grease A contains a very heat-stable silicone fluid thickened with a special grade of finely divided carbon. Designed for lubrication of conveyor systems and similar slow moving equipment operating at extremely high temperatures.

Grease B is designed for use in ball and roller bearings operating at temperatures ranging from −100 deg. F. to 300 deg. F. It is a soap base grease prepared from a heat-stable silicone oil with a very low freezing point.

Grease C is designed for the permanent lubrication of high speed, high temperature ball bearings.

Grease D is used to lubricate valves and packings exposed to a variety of corrosive materials at high and low temperatures. It is a translucent grease prepared from a silicone oil and thickened with silica.

Dramatic results have been reported with both the oils and greases. Many of these have enjoyed wide publicity.

FLUOROLUBRICANTS

Fluorolubricants are low molecular wt. (average 1,000-1,200) arborizations of the fluorothene polymer tree. Ranging from oils to waxes, the materials are finding their greatest applications in equipment handling liquid oxygen and other highly reactive materials. Heat stability (better than 600 deg. F.) is superior to silicones. Another advantage is that when they do reach their decomposition temperature, they vaporize completely leaving no residue. On the disadvantage side, the lubricants have a poor viscosity index compared with silicones and ordinary lubricating oils.

Materials are still largely experimental, available in pilot-plant quantities in several grades, high priced (as are all synthetic lubricants).

MOLYBDENUM

Molybdenum-based lubricants are latest on the scene. Molybdenum is carried in a volatile hydrocarbon which evaporates when subjected to high temperatures, leaving behind the molybdenum which adheres tightly to the metal surfaces, withstands extremes of temperature.

In liquid form a glycol derivative carries the molybdenum. The lubricant has about the same consistency and appearance as SAE 30 lube oil, vaporizes at about 800 deg. F. with less than .01 percent carbon. The molybdenum left behind will then function up to about 1,200 deg. F. for short periods. For this reason it is successfully used in the hot extrusion of steel.

In another form, the lubricant is incorporated in a heavy grease. Essentially the same properties as the liquid compound make the grease useful for such things as packing sealed ball bearings, kiln-car and oven lubrication, gear boxes, speed-reducers etc.

A liquid molybdenum thread compound answers the prayer of engineers and maintenance men who have to deal with threads that have become "frozen" under extreme conditions.

LARGE QUANTITIES:

Hexachlorocyclohexane

(*184B*) Now available in large quantities are the alpha and beta isomers of benzene hexachloride. Pennsylvania Salt Manufacturing Co., producer of the byproduct material, hopes it will find important uses in the chemical industry, especially during these times of critical shortages of benzene and chlorine.

The benzene hexachlorides have 16 possible stereoisomers, of which at least five are present in technical material. The alpha isomer (trans-form), decomposes to 1,2,4-trichlorobenzene, is soluble in water, alcohol, benzene and ether.

The beta isomer (cis-form), has a sublimation range 180-196 deg. C., is slightly soluble in acid, water and alcohol.

Both are free flowing, white crystalline materials, insecticidally inactive, mildly toxic.

UNIFORM STRENGTH:

Reinforced Laminate

(*184C*) A phenolic laminate with unwoven cotton fibers, random laid in the form of a mat, has been announced by the Richardson Co. This laminate features uniformity of strength in all directions, good machinability, and improved texture.

Designated Insurok-grade T-815, it is primarily intended for mechanical applications requiring uniform strength throughout, such as nonmetallic gears, cams, pinions, textile bobbin heads, and many other industrial parts. Grade

T-815 is reinforced by unwoven cotton fibers, random laid in a mat arrangement. This structure results in a uniformity of strength (tensile, impact, and flexural) in the main direction, cross direction, and at all intermediate angles throughout the plane of the material. The physical characteristics are rated as better than high-strength, woven cotton fabric-base materials.

Machinability of the laminate is good, and machined surfaces have a finish superior to any woven cotton fabric-base laminate made. It can be punched, shaped, turned, milled, drilled, or threaded, and such operations result in smooth, clean surfaces—similar to the machined surfaces of dense paper-base laminates. Intricate machined shapes, such as fine-pitch gears and threads, are obtainable. The new product also has good electrical and moisture resistant properties—improved over ordinary cotton fabric-base materials.

It is available in a complete range of sheet sizes and thicknesses. Descriptive data sheet is available upon request.

FOR SHOCK:

New Drug

(185A) A drug from the Sterling Winthrop Research Institute, promises to be of great importance for treatment of shock.

It is a synthetically produced hormone of the adrenal medulla and has been found in clinical trial to prevent fatalities that might otherwise occur due to lowered blood pressure.

Winthrop-Stearns has made the drug available to physicians as Levophed Solution, 1:1000 in 4-cc. vials for injection in high dilution into the blood stream.

Levophed is the most potent blood pressure stimulant now known to science. In a significant number of cases, shock patients who failed to respond to blood plasma alone, rallied when Levophed was added. Drugs hitherto available have either not been completely effective or have had disturbing side effects.

OPERATING ECONOMIES:

Foaming Agent

(185B) News of Masonoid CTM—a foaming and foam stabilizing agent comparable in some applications to soap bark has been announced by the Masonite Corp.'s chemical division. This co-product of the Masonite process of manufacturing hardboard has been suggested as a foaming agent for foamed glues, foamed insulation, tracer foams, chemical foams, low density paper and board products, low density concrete, mortar and cements.

A company representative says the product may offer operating economies not given by soap bark.

A technical bulletin is available.

HEAT RESISTANT:

Silicone-Base Paint

(185C) A heat-resistant aluminum paint capable of withstanding temperatures up to 1,700 deg. F. is announced by Speco, Inc.

Known as Heat-Rem H-170, the new paint utilizes a silicone base and, according to the manufacturer, fuses with surface metal immediately upon application. It is reputed to form a bright, elastic finish resistant to moisture, corrosion, mild acids, alkalis and industrial fumes.

Heat-Rem H-170 is said to set in 4 hr. and dry completely overnight on hot surfaces. It is recommended for use on heat lines, condensers, compressors, ovens, engine heads, mufflers, radiators, exhaust manifolds, etc. The manufacturer states that it makes possible the effective painting of many types of industrial equipment previously regarded as "unpaintable" due to temperature limitations.

The paint is packaged in 1-qt., 1-gal. and 5-gal. cans.

FOR RESILIENT FLOORINGS:

New Copolymer

(185D) A new P. V. acetate copolymer emulsion has been announced by the American Polymer Corp. The material, called Polyco 1673-37B is said to overcome brittleness and inadequate resistance to grease and solvents in resilient floorings. Floors based on the material are claimed to be superior to rubber floors in their resistance to abrasion and to alkalis, oils, greases and petroleum products. They are also more permanent towards aging or cracking.

The emulsions are available in a wide range of properties including solids content, molecular weight, particle size, particle charge and viscosity.

COMMERCIAL QUANTITIES:

Synthetic Carbazole

(185E) Synthetic carbazole now is in commercial quantities at Reilly Tar and Chemical Corp. with the recent activation of a newly-perfected process developed by the company.

According to company spokesmen, the new process frees industry from uncertain reliance upon the production of carbazole from the usual coal tar method. Actually the diphenylenimine has been available for some time, but presumably Reilly is the first company to produce commercial quantities of the chemical.

As the basic raw material for the hydrone series of dyes, carbazole has been known to the dyestuff industry for many years. It is also useful in the manufacture of explosives and in organic syntheses.

Among the newer uses for carbazole are:

Its interaction with acetylene to form vinyl carbazole—useful in electronics because of its dielectric properties and high melting point.

Its alkylation to form lubricants.

Its nitration and halogenation to make insecticides.

Its use as a rubber anti-oxidant.

Its use to inhibit rancid odors in synthetic detergents.

Synthetic carbazole has a mol. wt. of 167 and a purity of 97 percent minimum. It boils at approximately 353.5 deg. C., and its melting point is 245 deg. C. (initial) minimum.

New This Month . . .

	Page & Item
High Temperature Lubricants	184A
Hexachlorocyclohexane	184B
Reinforced Laminate	184C
New Drug	185A
Foaming Agent	185B
Silicone Base Paint	185C
Synthetic Carbazole	185D
New Copolymer	185E
Adsorptive Powder	185F
Aerosol Insecticide	186A
Allethrin	186B
Aluminum Coating	188A
4-Vinylpyridine	188B
Adherent Coating	188C
Flatting Agent	190A
Thermoplastic Material Sheet	190B

More Information . . .

To find out more about any of these new products, circle the item's number on Reader Service Postcard inside the back cover.

ULTRA-FINE:

Adsorptive Powder

(185F) A new hydrated aluminum magnesium silicate is a low-cost ultra-finely divided, dry, light-weight, free-flowing powder with good sorptive qualities. Attapulgus Clay Co. is the maker, recommends it for such variegated uses as filler, flattener, conditioner, coater, polisher, strengthener and bodying agent.

Product is chemically inert and essentially neutral. Particles all lie in the sub-sieve range, 90 to 95 percent by weight finer than 10 microns, average particle size 0.4—0.6 microns. Ultra-finely divided state of particles

(Continued)

provides exceptional covering power, ready dispersions in liquids, increases over-all efficiency. Spicular shape promotes excellent adherence.

Bulk density is 13—15-lb. per cu. ft. Useful as conditioner for adjusting bulk and for improving flowability and dispersion characteristics of dense materials. Wets almost instantaneously in water and disperses readily to a moderately stable suspension.

Excellent anti-caking, parting and coating agent. Imports free flowing qualities to dusts and granulated powders by virtue of its shape characteristics, fine particle size, and sorptiveness. Useful to condition deliquescent substances, and to adsorb surface moisture and prevent crystal growth. Prevents caking of heat-sensitive compounds both in processing steps and in storage.

Color, light cream shade; index of refration, 1.56.

Currently, small samples from pilot production are being offered free of charge for evaluation purposes. Larger amounts can be made available. In carload quantities, estimated price of attaclay SF is 2½ c. per lb., fob. Attapulgus, Ga.

HIGHLY EFFECTIVE:

Aerosol Insecticide

(*186A*) A mist spray of DDT, pyrethrum and piperonyl butoxide, has been marketed under the Knox Out label of the Pennsylvania Salt Manufacturing Co.

Designed mainly for household use, the company claims that a room 10 ft. square can be freed of small flying insects when the spray is released in all directions for 5 sec. and the room closed for 15 min. Larger insects, such as hornets and wasps, must be subjected to the spray for a few seconds longer. The spray may also be used out-of-doors for the temporary elimination of insect pests. For this purpose 100 sq. ft. of ground require spraying for 5 to 7 sec. and plants must be protected, according to the company.

FOR AEROSOLS:

Allethrin

(*186B*) In March of '49, Agriculture made it known that they had managed to synthesize the allyl analog of Cinerin I, (allethrin). After extensive tests, the military announced that allethrin had been approved as a replacement for natural pyrethrum in the low pressure aresols used by the Army.

The McLaughlin Gormley King Co., a leader in pyrethrum production,

(*Continued*)

If you are seeking that "extra something" to lift your product above competition, we suggest a careful look at the check list below. It shows some of the ways in which Celite* Mineral Fillers are improving quality and lowering costs in a wide range of industrial products.

Complete information, including sample and suggestions for using the grade of Celite Mineral Fillers best adapted to your needs, is available on request. Just write Johns-Manville, Box 290, New York 16, N. Y.

✓ **Added Bulk**
In detergents and other chemical compounds, Celite Fillers increase bulk, help reduce shipping costs.

✓ **Better Suspension**
In polishes, paints, dry mixtures, Celite Fillers improve suspension, help prevent segregation of ingredients.

✓ **Faster Cleaning Action**
In cleaning and cleanser compositions, Celite Fillers aid abrasive action without scratching.

✓ **Greater Absorption**
In many chemical compounds, Celite Fillers will absorb and retain large amounts of liquids and gases.

✓ **Improved Color**
In pigments, paints, paper, the white grades of Celite Fillers improve color and opacity of many products.

✓ **Better Dry Mixing**
In sticky or greasy materials, Celite Fillers impart a "drying" effect that gives a product free-flowing, paste or solid properties.

✓ **Better Dispersion**
In insecticides, Celite Fillers improve dispersion, aid grinding, improve kill power, give greater coverage.

✓ **More Durable Finish**
In molded products, paints, varnishes, lacquers, Celite Fillers impart a tough, lasting surface finish.

✓ **Increased Viscosity**
In adhesives and other liquids, small percentages of Celite Fillers will increase viscosity and improve spreading and coating properties.

✓ **Improved Flow**
In deliquescent materials, Celite Fillers prevent caking, preserve free-flowing properties.

✓ **Reduced Adhesion**
In latex molding, or on tacky surfaces or materials, Celite Fillers are used in dry dusting powder form as a separant.

✓ **Better Dielectric Properties**
In molded plastics, Celite Fillers contribute high dielectric strength, low power factor, good arcing resistance.

Inert, porous, and cellular—Celite Fillers are highest quality diatomaceous silica specially processed in many grades for industrial use. Their remarkable combination of physical properties, imparted by their unique diatom structure, includes great bulk per unit of weight, high absorption, large surface area and low refractive index.

*Reg. U. S. Pat. Off.

TABLE OF PROPERTIES

Grade Designation	Color	Fineness	Average Particle Size (Oden Method)	Free Moisture Content	Absorption* Water	Absorption* Linseed Oil	Bulking Value** Loose	Bulking Value** Wet	Specific Gravity
Celite FC	Light gray	Maximum 3% on 150 mesh	4-6 microns	Max. 6%	215	205	8	17	2.00
Celite SSC	Light pink	Maximum 5% on 150 mesh	6-8 microns	Max. 1%	210	190	9	17	2.15
Celite HSC	White	Maximum 7% on 150 mesh	7-9 microns	Max. 1%	220	180	10	17	2-30
Snow Floss	Light gray	Maximum 1% on 325 mesh	1-2 microns	Max. 6%	210	185	8	22	2.00
Super Floss	White	Maximum 1% on 325 mesh	2-4 microns	Max. 1%	150	120	9	28	2.30

*Gardner-Coleman Method—lbs. of liquid per 100 lb. of Celite. **lb. per cubic ft.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE

MINERAL FILLERS

plans to produce the equivalent of 2 million pounds this year. Further expansion plans at the company should step this production up.

ONE-STEP:
Aluminum Coating

(188A) Material to finish aluminum, either as a base for paint, or to protect the bare metal from corrosion, has been revealed by the Chemclean Products Corp.

The material is provided already mixed and needs only to be dissolved in water, 6 oz. per gal. The work is immersed in the solution at 185 deg. F., remaining in the bath about 5 min. No electric current is required. Equipment consists only of steel tanks with facilities for heating. The solution is "self-cleaning," making the process a one-operation job. Control is simple, easy, cost is low.

Material may be used on machine parts as well as decorative consumer parts, since no dimensional changes take place and close tolerances are not disturbed. As a base for paint, a high degree of adhesion is provided and the corrosion resistance is of a high order.

BUILDING BLOCK:
4-Vinylpyridine

(188B) A cousin of the coal-tar chemical 2-vinylpyridine, is 4-vinylpyridine, offered in commercial quantities by Reilly Chemical Corp.

The chemical is said to offer many possibilities as a building block. Among them: the manufacture of synthetic elastomers, plastics, textile chemicals, photographic chemicals and in organic syntheses. Some of the products which have been successfully produced from the chemical are: 4-polyvinylpyridine, 4-vinylpyridine-styrene copolymer, 4-pyridylethyl sulphides, 4-pyridylethyl sulphonic acid, 4-pyridylethyl quinolinium chloride, 4-pyridylethyl-dimethyl-phenyl-ammonium chloride, 4-pyridyl-ethyl-amines, 4-cyclohexenyl pyridine, 4-pyridylethyl ethers, 4-(2-nitroethyl) pyridine

CUTS GLARE:
Adherent Coating

(188C) A synthetic finish, VB 248, that was developed to permit dulling the reflecting surfaces of stainless steel in guided missiles, aircraft instruments and other apparatus, has been put on the market by the United Lacquer Manufacturing Corp.

The new finish licks the long-standing problem of providing an effective

(Continued)

One man – serving all three – saves your time

For more than twenty years Carbide and Carbon Chemicals has maintained a staff of technically trained representatives to serve its customers throughout the country. Now, more than ever, this policy means time and effort saved for you.

Every Carbide representative is a graduate chemist or chemical engineer. This basic technical knowledge, plus research experience in our laboratories, special training in our home office, and practical knowledge gained in the field, gives our representative the background needed to be of assistance to all three, the men in your plant, your laboratory, and your purchasing department.

When you have problems involving the use, development, or purchase of chemicals, call our nearest office and discuss them with a Carbide representative. And if you would like a copy of the 1951 edition of our booklet, "The Physical Properties of Synthetic Organic Chemicals," please call or write our nearest office.

CARBIDE AND CARBON CHEMICALS DIVISION

Union Carbide and Carbon Corporation

30 East 42nd Street New York 17, N.Y.

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In Canada:

Carbide and Carbon Chemicals, Limited, Toronto

coating that would adhere to the highly polished stainless steel used in various aircraft devices, United chemists reported.

VB 248 was developed originally in black, and in a dull finish. But, because of its good adhesion to highly polished surfaces, it hopes to find other applications where elimination of glare is not the primary objective. In such cases, the new synthetic material may be prepared in all colors, in a semi-gloss or gloss finish.

EFFICIENCY, COMPATIBILITY:
Flatting Agent

(*190A*) Syloid 308, for use in lacquer formulations, has been announced by the Davison Chemical Corp. According to Davison, the flatting agent offers three advantages: (1) It's economical because it has a high degree of flatting efficiency and because it quickly and readily mixes in the mills with other lacquer constituents; (2) It gives positive control over the degree of matte finish obtained when the lacquer is applied; (3) The agent will not cause deterioration of film properties. (They excluded organics because these had been known to cause film deterioration.)

The desirable properties of the flatting agent can be credited to synthetic silica of controlled particle size.

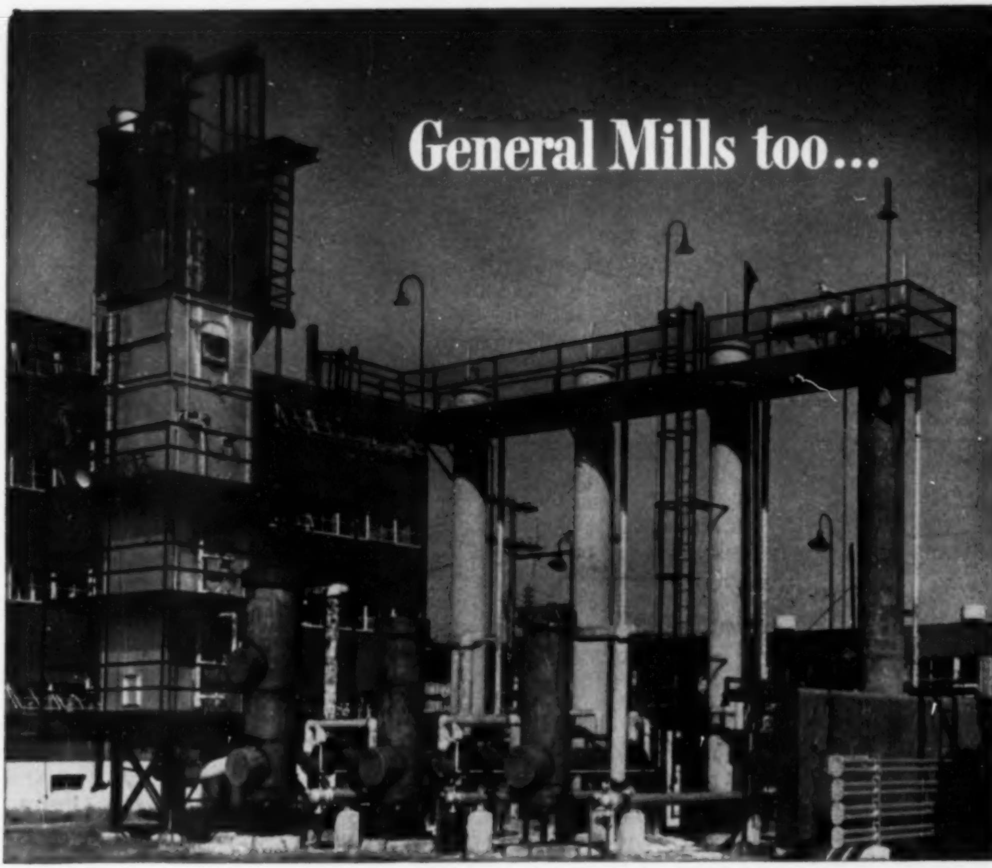
FLAME-RESISTANT:
Thermoplastic Sheet Material

(*190B*) U. S. Rubber Co. has announced a new Royalite thermoplastic sheet material which will not support combustion. It is intended for use in airplanes and other applications where flame-resisting properties are desirable.

The company is delivering flame-resistant Royalite in flat sheets in several standard sizes. It is made in four standard colors and five grains.

In airplanes, the new material is considered practical for interior fairways, instrument boards, cable covers, covers for protruding instruments, hood frames for wing tip lights, window frames and other applications.

In addition to being flame-resistant, it is extremely tough, highly resistant to impact and light in weight. It can be easily formed into simple or compound shapes. It is non-corrodible, stable under changing atmospheric conditions, with exceptional electrical insulating properties and low rate of heat conductivity and water absorption. It will not chip or warp, is easy to clean, stainproof, greaseproof and mildewproof. *—End*



uses a **Girdler Hydrogen Plant**

Works speak louder than words

GAS PROCESSES DIVISION

THE GIRDLER CORPORATION

LOUISVILLE 1, KENTUCKY

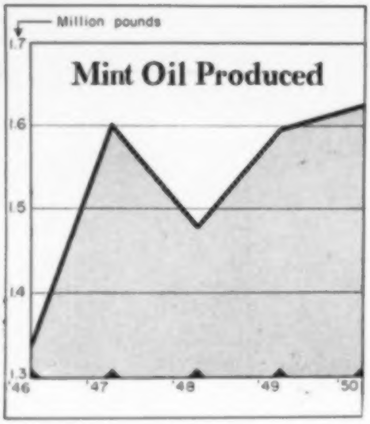
Designers, Engineers and Constructors

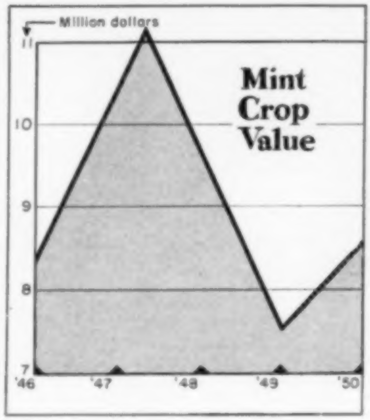
"MODERN FROM THE GROUND UP!" That best describes General Mills' new Chemoil plant at Kankakee, Illinois. To achieve high quality production at lowest cost, modern processes are used throughout. That's where Girdler's HYGIRTOL* Hydrogen Plant comes in.

This unit produces 150,000 cubic feet of hydrogen a day for the hydrogenation of high-grade fatty acid products. The hydrogen—99.8% purity—is produced at lower cost than is possible with *any other commercial method.* Operation of the plant is continuous, automatic, instrument-controlled—another mark of modern methods!

Let Girdler help *you* improve processing efficiency. Girdler designs and builds plants to produce, purify, or use industrial and chemical process gases . . . organic compounds. Write now about your process problems.

*HYGIRTOL is a trade mark of The Girdler Corporation





A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Peppermint Oil

Why it's important Chances are you don't think much about the pepperminty flavor in a stick of gum or tube of toothpaste. But the manufacturer does. He thinks enough of the aromatic herb to spend roughly $10 million a year on the oil derived from the peppermint plant. That's big business and canny northwestern farmers are cashing in on natural resources (peppermint acreage in the Northwest gives up to 100 percent greater yields of oil than comparable plantings in other areas) and the foresight of I. P. Callison and Sons of Chehalis, Wash., who early in 1949, designed a plant big enough to handle more oil than the entire Northwest crop at that time.

Callison, the second largest domestic producer of refined peppermint oil, operates the world's first continuous refining unit designed to manufacture the oil. When speaking of the 50-ft. unit which he and E. B. Badger and Sons designed, Callison points with sparkling eyes, at the $100,000 still which refines about 2,400 lb. of peppermint oil each day.

What's new Here's what's new and different about the plant and process. Relatively low temperatures, too low to cause thermal decomposition, are used. This means that natural flavor and odor of the oil are retained. Another advantage: intermediate fractions can be separated.

How the process works Maybe the great-great grandfather of the young man on the page opposite, made wine in the bath tub back in sunny Italy. Fact is, the processing step pictured here isn't a far cry from wine-making. Instead of squeezing juice from grapes, the distilling vat above uses low-pressure steam to remove oil from the plant.

Decanting Next step is decantation. Nine of these decanters are shown on a farm near the Callison plant. Set up next to the distilling vats, they take the mixture of condensed steam and peppermint oil from step 1. Oil rises to the top and is periodically drawn off. The decanted oil is put into 52-gal. metal drums, carted off to the plant. Once the oil reaches the plant, obviously the materials handling problem is greatly simplified.

Blending At the plant, each drum is sampled and graded for color, odor and flavor. Then chemical and physical properties are determined. The satisfactory grades of oil are discharged into blending tanks to begin the cycle of oil processing. The blended oil is pumped into the feed tank shown on the next page. From there into an intermediate point on the first bubble cap column of the fractionating system shown in the left background of the same cut. Steam introduced into the base of the column carries overhead a small amount of low-boiling fraction. The oil-steam vapors are condensed and received into a separator. Part of the oil is refluxed. The steam condensate along with any residual oil, is pumped to a small stripping column which returns the residual oil to the condenser.

Fractionating Oil from the bottom of the first fractionating column is then pumped to an intermediate point in a second fractionator from the base of which a small volume of the heaviest fraction of the oil is removed. Overhead from this fractionator is condensed and separated from steam condensate, and the water, along with any residual oil, is discharged into the stripper. The overhead oil is then received into holding tanks. From them the oil is piped into blending tanks where any necessary blending with other oil fractions to meet customer requirements can be performed. After being centrifuged for removal of any water or solid matter the oil is pumped to finished product storage for shipment.

It costs more to fix piping now!

No. 1615 Diaphragm Valve
Iron Body, Neoprene lined

You do less fixing by using Dependable Quality CRANE VALVES

...That's why more Crane Valves are used than any other make

better performing diaphragm valves

Separate disc and diaphragm design distinguishes these Crane Valves from all similar packless types. Life of diaphragm is multiplied because it's used only to seal the bonnet—not for seating. The separate disc seats the valve, eliminating wear and tear on the diaphragm.

Increased flow capacity . . . reduced flow resistance . . . tighter seating . . . lower torque and fewer turns to operate . . . are typical added features of Crane Diaphragm Valves. Wherever you use them, you can be sure of outstanding performance.

Such better quality and greater dependability mark Crane valves and fittings of every type—and assure the lowest ultimate cost.

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CRANE CO., *General Offices:*
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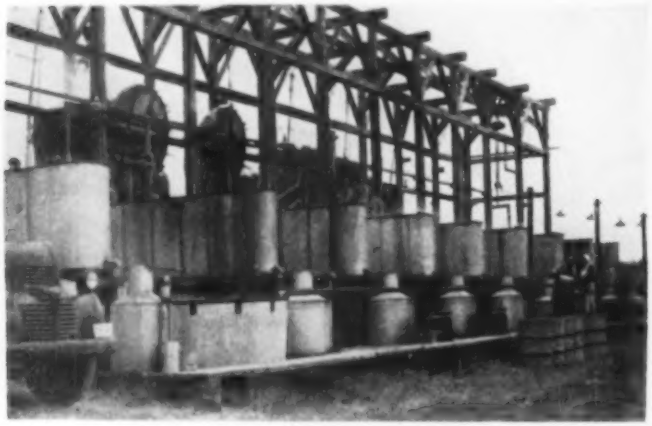
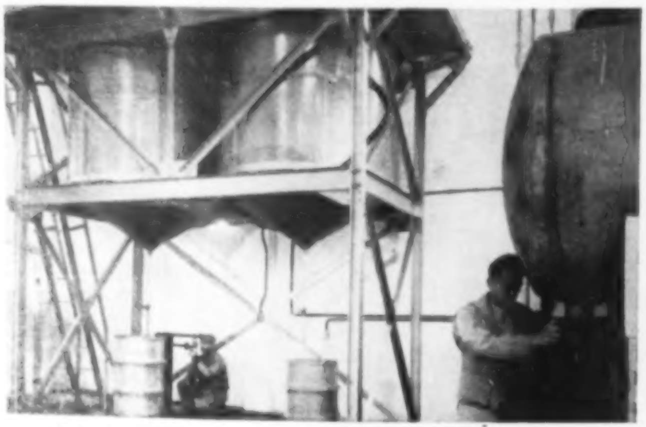
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

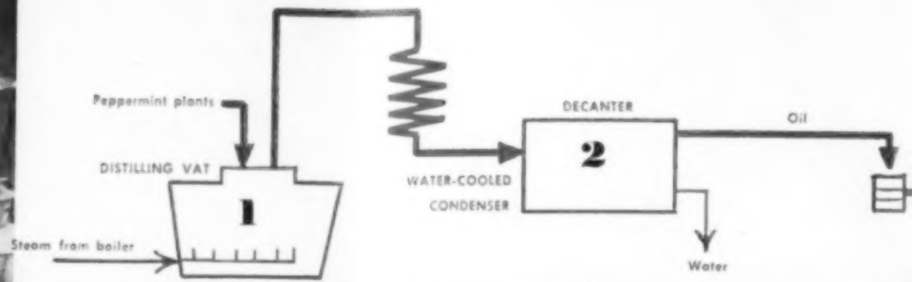
1 STOMPING to chewing is the story of peppermint oil—big business. Hay compressed, steamed to remove oil; 50 percent ends up in chewing gum.



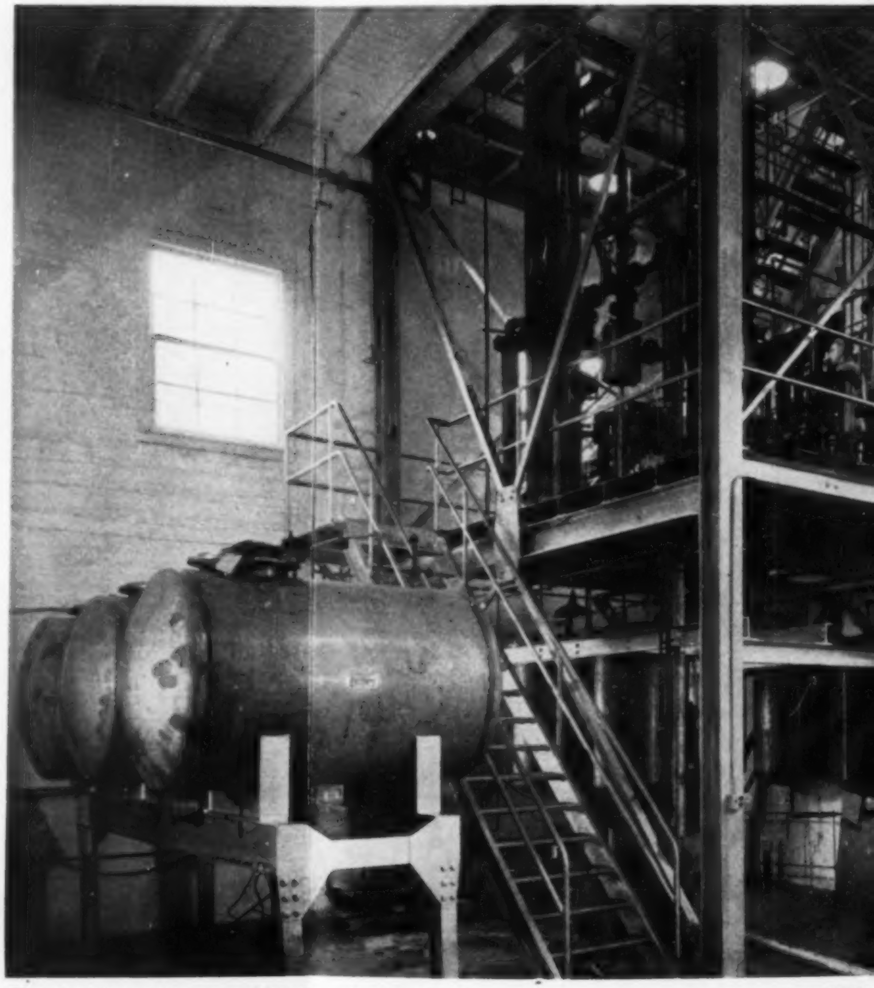
2 DECANTERS set up on a peppermint farm receive mixture of condensed steam and oil from distilling vat. Oil rises, is periodically drawn off.



BLENDING TANKS, made of stainless steel, begin the cycle of processing inside the plant. They receive only acceptable grades of the oil.

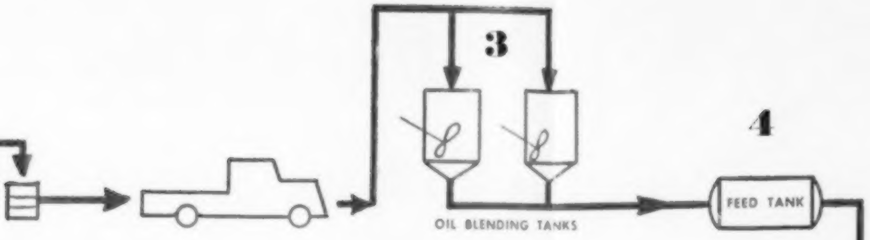


5 COLUMN NO. 1 receives blended oil at a fixed rate. The oil enters the column at one of the middle plates.

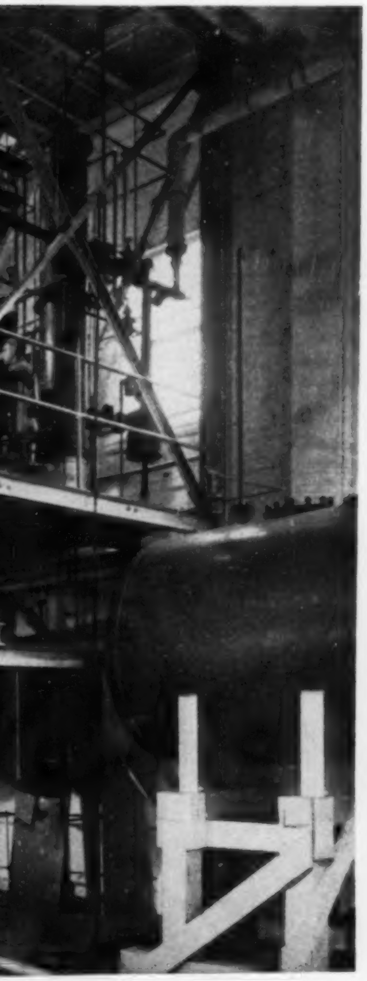


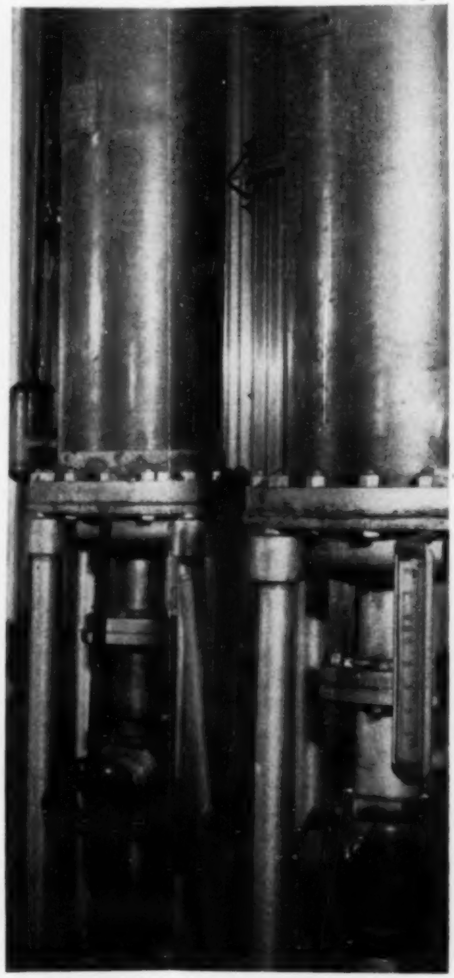
7 HOLDING TANKS store finished oil after drawing it off one of the upper pasteurizing plates, decanting.

4 FEED
oil, is



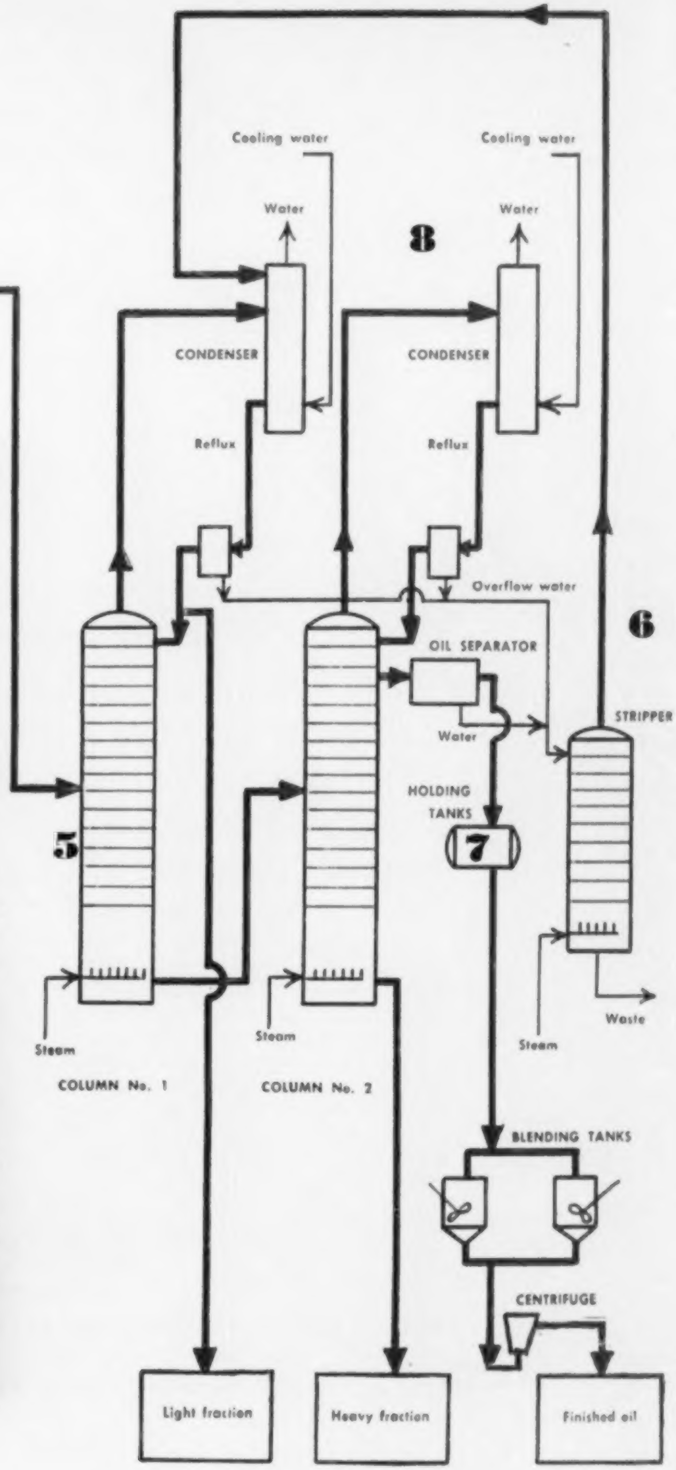
6 STRIPPER receives residual oil, boils it off.

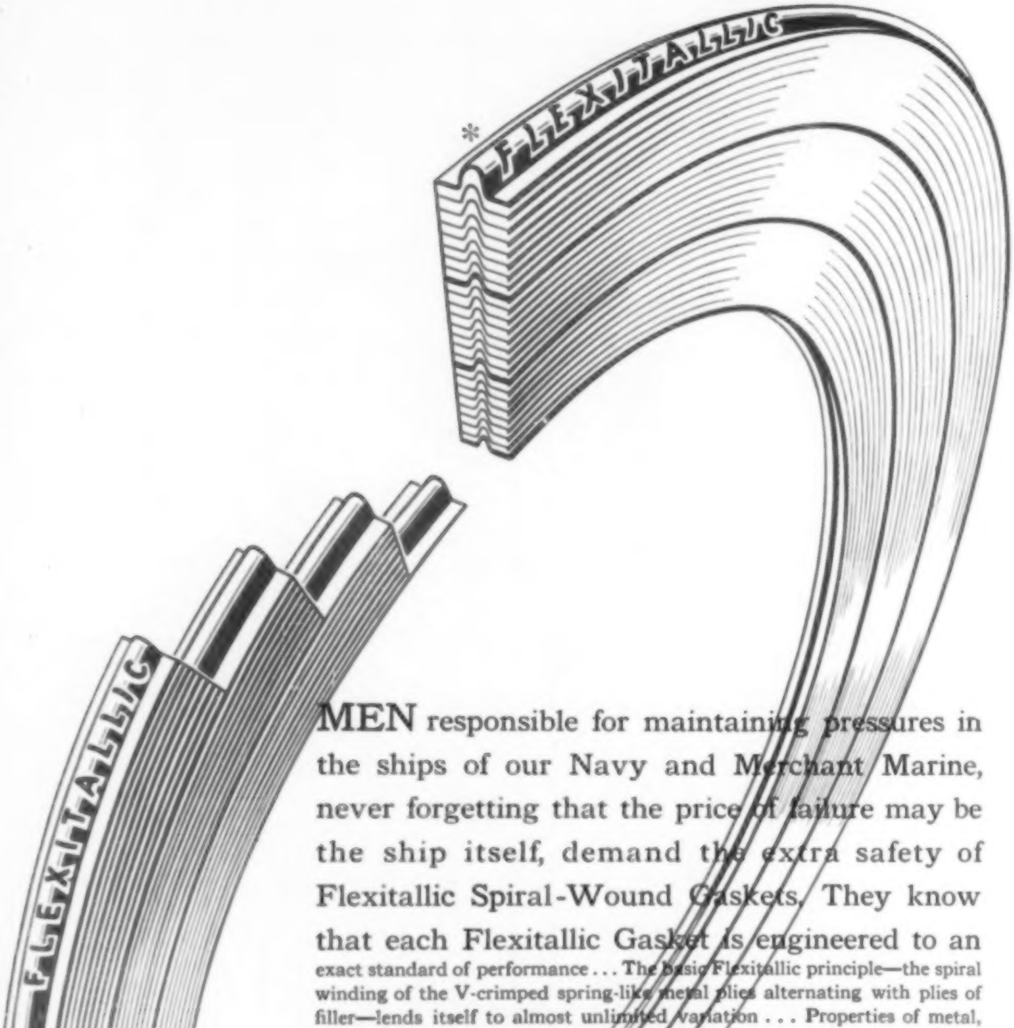




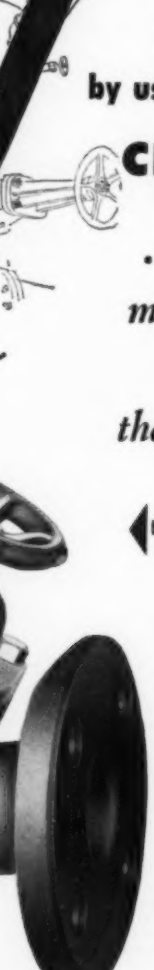
FEED TANK holds 1,500 gal. of blended oil, is fabricated of tin-lined copper.

8 WATER COOLED CONDENSERS separate lower boiling fractions of the oil from the condensed steam.

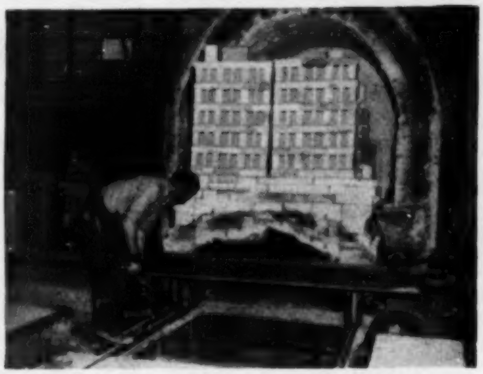




No. 1615 Diaphragm Valve
Iron Body, Neoprene lined



ELECTRIC FURNACES fuse charge into crude zirconia.



CONE 35 KILN fires zirconia pieces to 3,180 deg. F.

Fused Stabilized Zirconia

New realm of processes at high temperatures made possible by advent of the fused stabilized oxide.

Processing temperatures in the range of 4,600-4,700 deg. F. are now within reach with commercially available refractories, following addition of fused stabilized zirconia to Norton Co.'s regular line of extreme high-temperature refractory products.

Since 1946 Norton has been producing this material in experimental quantities. Only other present maker is Titanium Alloy Mfg. Co. Now, following thorough testing of both product and markets, and with a 1950 production tonnage somewhere in three figures, Norton is expanding production facilities, developing automatic molding methods, and reducing prices sharply. Compared with the $2-per-lb. price for refractory grain that would have been required with the 1946 process, the grain is now selling at an average of 50c. per lb. Molded shapes run higher, a typical price being $9.43 for a standard 9-in. brick which, weighing 16 lb., figures out at 59 c. per lb. With further processing improvements, prices are expected to go considerably lower.

Prior to development of zirconia, commercial refractories were not previously available for temperatures above about 3,400 deg. F. Hence, not much is yet known of uses for zirconia refractories. Only present large-scale commercial use is as kiln furniture for the firing of barium titanate resistors which are used as capacitors in electronics. This application depends on the fact that the titanate reacts with most refractories at its 2,500 deg. F. firing temperature; not on the high refractoriness of zirconia. Experimental applications indicate uses in cracking and reforming of hydrocarbon gases to acetylene, ethylene, etc.; fixation of atmospheric nitrogen (Food Machinery-Wisconsin process); melting and sintering of certain metals; and as resistors for high-temperature resistance and high-frequency electric furnaces. Experimental work is also being carried out in jet and rocket engines.

Five metallic oxides are of interest in the extreme high temperature field, including alumina, beryllia, zirconia, magnesia and thoria. Melting points of the pure oxides are reported as approximately 3,700 deg. F. for alumina, 4,170 for beryllia, 4,920 for zirconia, 5,070 for magnesia and 5,520 deg. F. for thoria. Alumina refractories are used successfully at temperatures to about 3,400 deg. F. Beryllia is not used commercially because, although it has good resistance to reducing atmospheres and good thermal shock resistance, it is high in cost and volatilizes above 3,000 deg. F. in the presence of water vapor. Magnesia is a basic refractory and is easily reduced at high temperatures. Its applications therefore are limited to oxidizing atmospheres, at temperatures not much over 4,000 deg. F., since volatilization commences at about 4,170 deg. F. Thoria has a number of disadvantages, including an extremely high specific gravity of 9.6, poor thermal shock resistance, high expense, and radioactivity. Supplies are under control of the Atomic Energy Commission.

In the stabilized form, zirconia lacks the disadvantages of the higher melting magnesia and thoria and thus looks like by far the best bet for extreme temperature use. Pure zirconia, however, cannot be used because it undergoes a change from monoclinic to tetragonal crystal form at about 1,800 deg. F., with a drastic 7 percent volume change on inversion which would quickly ruin the refractory.

In 1929 a German ceramist, O. Ruff, discovered that zirconia could be stabilized by combining certain metallic oxides—such as those of magnesium, calcium, scandium and yttrium—with the ZrO_2 in the form of solid solutions. Thus the crystal structure was altered to the cubic, which undergoes no inversion. Unfortunately, completely stabilized zirconia has a high coefficient of thermal expansion, which again is sufficient to cause cracking of refractory shapes after a few cycles of heating and cooling. The solution lay in using partially stabilized zirconia which, although it inverts partially, has a relatively low expansion and is capable of withstanding many heating-cooling cycles without disruption.

(Continued)

Material now used in Norton zirconia refractories contains about 25 percent of the unstabilized form—the optium composition—and has a high degree of thermal shock resistance. Control, which is accomplished in the electric furnace fusion process, is readily checked by X-ray diffraction measurements.

Stabilized zirconia has some interesting and, to some extent, contradictory properties. Its fusion temperature is in the neighborhood of 4,700 deg. F., compared with 4,920 deg. for the pure oxide. It is of low reactivity and resists oxidizing and moderately reducing atmospheres. It does not volatilize at high temperatures and has the lowest thermal conductivity of any commercial refractory material —about 6.2 for the dense oxide, 4.7 for insulating (porous) refractory shapes, and 2.8 for insulating grain. These *k* factors are at 2,000 deg. F., expressed on the usual basis of Btu./(sq. ft., hr., deg. F. per in.). Such a low thermal conductivity means that the refractory can be used at temperatures close to its fusion point, with fusion only at the hot face. Comparable conductivities are 56 for silicon carbide, 17 for fused alumina and 18 for fused magnesia.

Fused stabilized zirconia has a true specific gravity of 5.6 and a bulk density of 4 – 4.4 in the dense form and 2.5 in the insulating form. At low temperatures the material has a high electrical resistance, but this drops sharply at high temperatures. Specific resistivity is 2,300 ohm cm. at 1,300 deg. F., but only 0.37 ohm cm. at 4,000 deg. F. This means that zirconia can be used advantageously as a resistor in both resistance and high-frequency furnaces, provided only that means is available for heating the refractory resistor for starting. Because the conductivity increases with increasing temperature, such a furnace requires close current control to avoid the possibility of overheating.

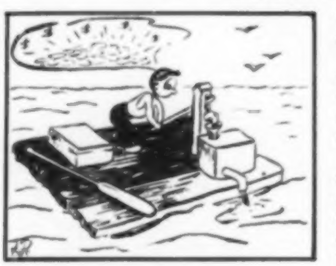
Norton attributes the new lowered prices of stabilized zirconia refractories to an improved process (U.S. patent 2,535,526, Dec. 26, 1950) being used at its Chippawa, Ont., electric furnace plant for production of the crude stabilized material. Zirconia raw materials vary in ZrO_2 content from 65 to about 95 percent. By far the cheapest of these are the zircon sands of Florida and Australia. Present raw material, from Australia, runs 65-67 percent ZrO_2. This ore is substantially pure zircon ($ZrSiO_4$), with less than 0.25 percent of TiO_2. The zircon is mixed with lime, calcined metallurgical coke and iron borings and charged continuously to an electric arc furnace of the type used in producing fused alumina. Fusion and purification require about 40 hr., with about one-third of the silica volatilizing, and two-thirds being reduced by the coke to silicon, which combines with the iron borings to form magnetic ferrosilicon.

The lime addition is sufficient to leave 5 percent of CaO in the finished product in the form of a solid solution in ZrO_2. The coke charged equals the theoretical requirement for reducing two-thirds of the silica, while the quantity of iron used is that needed to combine with the silicon produced. The ferrosilicon settles to the bottom as a large button. After fusion is completed, the fused mass is allowed to cool to a solid pig which is broken up with sledges and sorted into fused crude material, partially fused material, and sweepings. The fully fused material is crushed to 6 mesh and passed over a magnetic separator to remove any metal. Partially fused material, sweepings and the reject of the separator are reprocessed to recover zirconia.

In a single step this process eliminates virtually all of the silica impurity, leaving a pure crude product of about 99.06 percent ZrO_2 plus CaO; 0.2 percent SiO_2; 0.52 percent Fe_2O_3; and 0.22 percent TiO_2. This product is transported to the company's Worcester, Mass., plant for further grinding, grain sizing and refractory manufacturing operations.

As is true of other "pure-oxide" refractories, zirconia refractories are of the self-bonded type, without a clay (glass) bond which would lower the use temperature. This means a careful mixture of grain sizes such that the finer particles grow and form interlocking crystals during the kilning. The sized grain mixture is first mixed with a small percentage of organic binder in a Norton-developed pan-and-plow mixer, after which the virtually dry mix is molded either by hydraulic pressing in steel molds, or by tamping in steel or wooden molds. Molded shapes are then carefully dried and fired in one of two cone-35 kilns at about 3,180 deg. F. A third kiln, now building, will have a capacity of about four times that of the larger of the two present kilns. The larger present kiln and the new one are of the regenerative car type, but operate as periodic kilns since the variety of shapes and compositions that must be fired at a time demands more flexibility than is possible in a tunnel kiln.

LITTLE BONERS



A Decimal of Gold

There was no doubt about it, the company's new ion exchange resin was really the world's best for picking up traces of heavy metals. One day a researcher had an idea, looked up a reference in the literature, did some hurried figuring.

Yes, by golly, it would be damned profitable to recover gold from sea water. Excitement ran high. The company had a bonanza. What a gold mine! Uncle Sam would have to enlarge Fort Knox, all right.

Somebody grabbed a bucketful of sea water, ran it through the resin. The gold was taken out, every trace of it. But the resin didn't have the amount of gold expected.

Maybe the sample was no good. Try again. No. Maybe the sea water had been diluted by fresh water or currents. Try other locations. Bring in samples from all over the world. Still no good; only 10 percent recovered—yet not a trace of gold left in the water!

After several months, one irreverent skeptic even brought "the literature" under suspicion. A careful check showed that some editor had misplaced a decimal point. Imagine that!

Oh no, we didn't make that slip! It was a German editor, of course. And he said he really didn't do it—it was all caused by that careless printer who didn't follow instructions. Just the same, the company still looks a bit askance at all editors. Watch for other true "Little Boners" to come.

Award Offers Incentive To Young Chemical Engineers

This year for the first time the Chemical Engineers of Greater New York will present an annual award to an outstanding young chemical engineer in the New York area. The award is being established to create a non-monetary recognition for exceptional service to humanity and outstanding professional achievement.

Most awards in the fields of engineering and chemistry are based only on the magnitude of the achievement,

(Continued)

Turbo-Topics

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Permanent peak production usually requires continuous duty. All Turbo-Mixers are designed with ample safety factors for 24-hour service.

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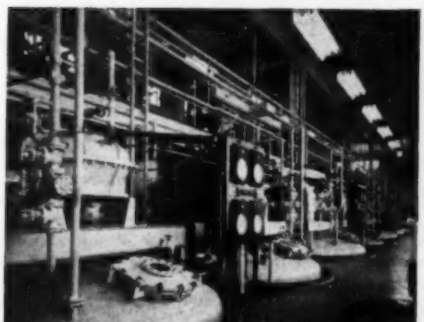
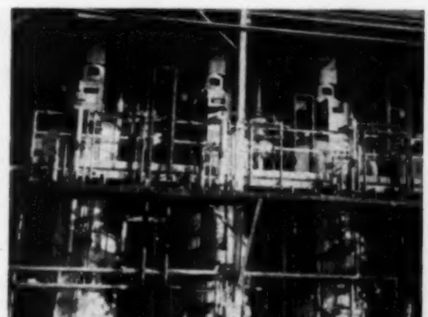


Turbo-Mixer equipped antibiotic fermenters at the Upjohn Company, Kalamazoo, Mich.



Part of an installation of Turbo Hydrogenators at Armour & Company, McCook, Ill.

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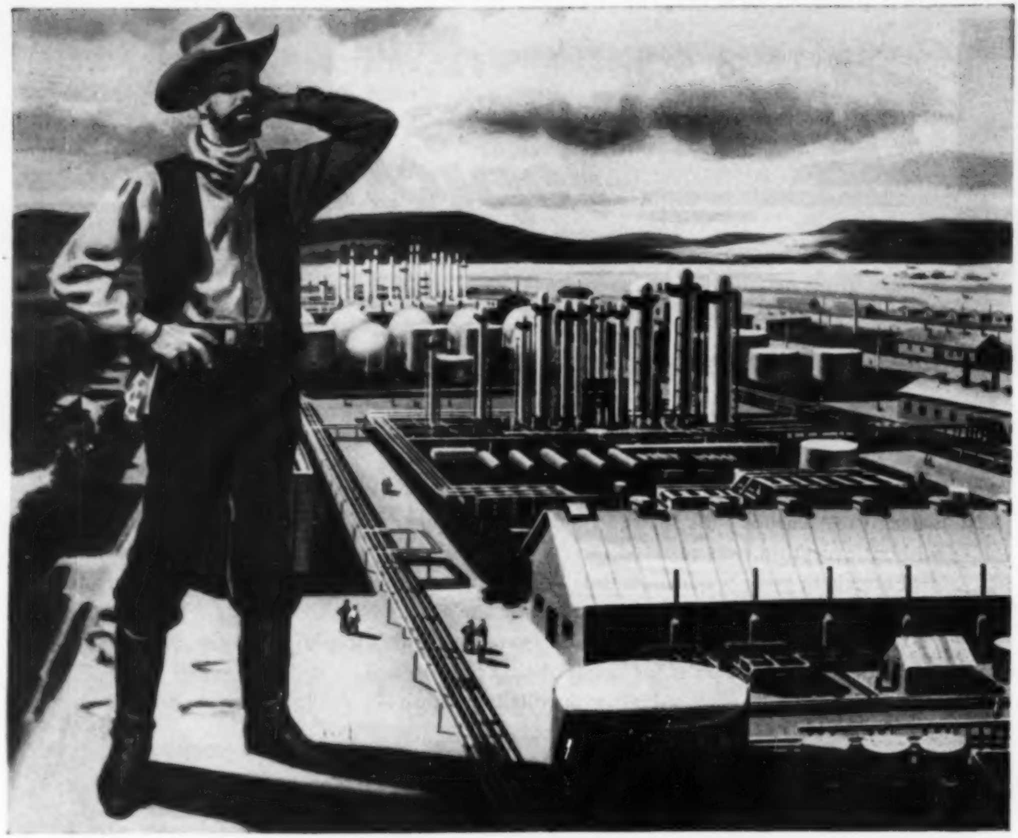

with less consideration of the number of years of effort it involved. Hence the older, more experienced man has a definite advantage. However, real ability can be found among young chemical engineers, and the purpose of the new award is to recognize contributions achieved early in the professional career.

The award will be made to a chemical engineer, 32 years of age or younger, who has shown outstanding professional ability and service to humanity. Any young chemical engineer working within the geographic area of the society—that is, the New York-New Jersey metropolitan area—is eligible. Equal consideration will be given to chemical engineers working in research and development, production, sales, and other fields.

Nominations for the award are sought from all manufacturers, research laboratories, colleges and universities, professional groups, and trade organizations in this area. The sponsoring society is anxious not to miss any qualified candidate for the award. Individuals wishing to make a nomination can secure an application from the chairman of the board of judges, Sidney D. Kirkpatrick, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

Judges are leaders in the fields of publishing, research, consulting, manu-

(Continued)

CONVENTION CALENDAR

- Society of the Plastics Industry, Reinforced Plastics Division meeting, Sixth annual technical session, Edgewater Beach Hotel, Chicago, February 28-March 2.
- Pittsburgh Conference on Analytical Chemistry & Applied Spectroscopy, William Penn Hotel, Pittsburgh, Pa. March 5-7.
- American Society for Testing Materials, spring meeting and committee week, Cincinnati, March 5-9.
- Drug, Chemical & Allied Trades Section, New York Board of Trade, 25th annual dinner, Waldorf-Astoria Hotel, New York, March 8.
- American Institute of Chemical Engineers, regional meeting, Greenbrier Hotel, White Sulphur Springs, Va., March 11-14.
- National Association of Corrosion Engineers, conference and exhibition, Statler Hotel, New York, March 13-16.
- Seventh Western Metal Show, American Society for Metals, Civic Auditorium, Oakland, Calif., March 19-23.
- American Wood-Preservers' Association, annual meeting, Stevens Hotel, Chicago, April 24-26.
- Materials Handling Exposition, International Amphitheatre, Chicago, April 30-May 4.

facturing, sales and production. Their wide and varied contacts with chemical engineers in their respective fields qualify them to select the outstanding young chemical engineer of the year.

Members of the judging committee are as follows: Sidney D. Kirkpatrick, chairman, McGraw-Hill Publishing Co.; Dr. H. B. H. Cooper, Calco Chemical Division, American Cyanamid Co.; Zola G. Deutsch, consultant; Dr. Donald F. Othmer, Brooklyn Polytechnic Institute; Robert L. Taylor, Manufacturing Chemists' Association, Inc.; Dr. William Bowman, Jefferson Chemical Co. Other members of the board will be announced later. Closing date for nominations is April 30.

Stauffer Expands Chlorine Capacity for Second Time

Stauffer Chemical Co. is expanding its chlorine capacity at Niagara Falls. A 50 percent expansion was announced a year ago, and that added capacity will be ready in about two months. The second expansion, just announced, will bring total capacity to well over 100 tons daily. Completion of this second expansion is set for January 1952. Stauffer engineers, together with Singmaster & Breyer, are handling the project; local contractors will be used.

The big jump in chlorine demand, which has kept this chemical in tight supply for the last few years, plus Stauffer's stepped-up production of carbon tetrachloride and other chlorinated products at Niagara Falls, led to the decision to go ahead.

Chlorine production facilities at Stauffer's big plant at Henderson, Nev., have also been enlarged within recent months.

New plants at Houston, Tex.; Tacoma, Wash.; Lowland, Tenn.; and Los Angeles, Calif. (to produce insecticides, superphosphate fertilizer, carbon bisulphide and sulphuric acid, respectively) were announced earlier.

Design of Equipment for Atomic Power Plants Pushed

Allis-Chalmers Manufacturing Co. is now participating in atomic power plant development work at major installations in the United States. This activity will be stepped up during 1951. One project calls for manufacture and testing of trial units; these units operate in the fluids and gases being used in the final nuclear power plant installations. Associated research has brought forth many new equip-

(Continued)

ment designs that promise improved performance, together with minimum weight and space requirements.

Apparatus being developed for atomic energy utilization includes equipment for pumping liquid metals, both by mechanical methods and by application of electromagnetic forces. The need for bearings that will sustain both radial and thrust loads without lubrication under extreme temperature conditions has resulted in designs that have come through tests with calculated performance equaled or exceeded.

Hermetically sealed motors and drives for constant speed or variable speed control are currently being developed and tested at one atomic power project. A totally sealed valve designed for remote actuation by liquid pressure in the line has been tested. It may have applications in nuclear power plants. Application of gas turbines utilizing nuclear heat for power generation at high pressure and temperature levels has been the subject of engineering and machine design. Substantial advantages over more conventional systems may be attained in the future by this means.

Oak Ridge Offers Engineers Course on Nuclear Reactors

Engineers from industry are at last to get an opportunity to learn first-hand about nuclear technology. The U. S. Atomic Energy Commission is now taking applications for enrollment in the 1951-52 session of the Oak Ridge School of Reactor Technology, which begins September 10. Many firms have wanted to send their engineers to this school. But they'll have to act fast: only about 50 applicants can be accommodated, and the application deadline is April 1.

Purpose of the school is to train engineers in reactor theory and technology. Most problems involve the same fundamental engineering and management skills common to industry, but the applications are to the particular needs of nuclear engineering. The school will acquaint experienced engineers with the problems faced by AEC. Trainees, returning to their companies after completing the course, can help their companies to participate in the nation's atomic energy program.

Trainees sponsored by government agencies and those from industrial organizations affiliated with or interested in the AEC reactor development program can attend the school as category B students. Applications for enrollment must be made by the firms or

agencies employing the applicants. Such students remain on the payrolls of their home organizations.

Much material in the curriculum of the Oak Ridge School of Reactor Technology will be classified. Hence all enrollments are contingent upon a personnel security investigation.

Further information and application forms can be secured from the Director of the Oak Ridge School of Reactor Technology, Post Office Box P, Oak Ridge, Tenn. Application as a category B student must be specified. These applications must be filed with the director of the school not later than April 1. Appointments will be announced in April.

Man in White Fuels Rockets For Flight Into Wild Blue

Working with liquid rocket propellants is an important but often risky assignment. Take, for example, a propellant composed of red fuming nitric acid (RFNA) and aniline. Often colorless and odorless, but highly toxic and readily absorbed through the skin, aniline can prove deadly if enough of it enters the blood stream. Thus, special clothing for these workers is a must, since even the most experienced handlers cannot count on their know-how alone to save them from mishaps. That's why new protective clothing that couples on-the-job safety with wearing ease has been developed for the men who handle liquid rocket propellants for the U. S. Air Force.

It was out at the Wright-Patterson Air Force Base in Dayton, Ohio, that researchers finally came up with the answer. As long as two years ago, the Clothing Branch of the Air Materiel Command's Aero Medical Laboratory there tackled the problem of providing

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this clothing. Their goal: a protective assembly that would afford over-all body protection, incorporate a method of interior cooling, and still give the worker wearing comfort and plenty of elbow room.

End product of this research and development is a new coverall and hood assembly made from vinyl-impregnated fiberglass; butyl rubber boots and vinyl-coated cotton gloves. A plastic visor in the hood affords the wearer ample front and side visibility.

To avoid overheating, two methods of internal cooling have been devised for this protective gear.

First of these, air cooling, utilizes an air-ventilated harness attached to a nylon suit that is worn underneath the protective coverall. Plastic tubes disperse the air throughout the interior of the assembly. The circulating air is supplied by an expansion turbine similar to the type used for cooling cockpits of fighter planes. A 50-ft. length of $\frac{3}{8}$-in. plastic tubing delivers the air from the turbine to the suit harness. The circulating air within the hood prevents toxic fumes from entering the hood interior, thereby eliminating the need for a respirator.

The second cooling method is water evaporation. This one employs an outer shell of mercerized cotton that fits over the protective coverall. By saturating the cotton outer shell with water, overheating can be reduced greatly. With this method, the air ventilation and interior suit is not necessary. An air breathing apparatus (demand type), suspended by shoulder straps, is provided for the protection of the respiratory system. Of the two methods, engineers favor the more economical water evaporation, which also provides the wearer a greater degree of comfort and ease in working.

Du Pont Unwraps Continuous Tetraethyl Lead Process

A new continuous process for the manufacture of tetraethyl lead has been perfected by Du Pont in time to bolster U. S. defense needs. Construction will start immediately on the first new continuous production unit. It will have an annual capacity of about 50 million pounds of tetraethyl lead. This expansion will help Du Pont to meet the heavy TEL demand for high-octane fuel.

Right now, tetraethyl lead is made in batches by a process Du Pont developed in 1923. Besides increasing output, the new continuous process eliminates the need for equipment made of special steel alloys that are

essential in the batch process. This will release these critical metals for other defense uses.

The new process is the result of advanced engineering design, and a major change in the basic chemical process. It promises greater productive efficiency, and in time will probably supplant the batch process.

The continuous process TEL plant will be located at Du Pont's Chambers Works at Deepwater Point, N. J. It is expected to be in production by next January. Contracts have already been given out for both materials of construction and manufacture.

Sodium to supply the needs of this expanded TEL production will be furnished by the adoption of a new process now being installed at Memphis, Tenn., for production of sodium cyanide from hydrogen cyanide and caustic (*Chem. Eng.*, Jan. 1951, p. 188). Sodium cyanide is currently being produced by a process requiring metallic sodium. Upon completion of the Memphis plant by January 1952, this sodium will be available for tetraethyl lead production.

Reopening Magnesium Plants Will Swell U. S. Stockpile

As directed by the Munitions Board, two more government-owned magnesium plants are to be reopened to produce this vital metal for the national stockpile. The two plants, held in the national industrial reserve by General Services Administration, are at Velasco, Tex., and Manteca, Calif.

Late in December, GSA announced the reopening of three other plants in Ohio, Connecticut and New York.

The five plants are to produce about 312 million pounds of magnesium in the next two years. Unless conditions dictate otherwise, the entire output will be stockpiled.

Contracts have been signed for the rehabilitation and operation of the plants and purchase of output by the government at market prices.

Details on the five plants are:

Painesville, Ohio, plant will go into production in April. Operator is Diamond Magnesium Corp. (subsidiary of Diamond Alkali Co.), which had the plant in World War II. Production is to be 72 million pounds in the next two years.

Canaan, Conn., and Wingdale, N. Y., plants are to be in production this month. Operator is a New England Lime Co. subsidiary, Nelco Metals, Inc. Production is to be 20 million pounds in the next two years.

The Velasco, Tex., plant will be producing in May. Dow Chemical Co. will run this plant, as it did in the

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NEWS, *cont.* . .

last war. The plant will turn out 160 million pounds during the next two years.

In July, the Manteca, Calif., plant will be running. It's operated by Kaiser Magnesium Co. Kaiser's Permanente Metals Corp. ran it in World War II. Production over the coming two years will be 40 million pounds.

The government will spend $700,000 on the Manteca plant and $3 million on the Velasco one, to rehabilitate them.

Manteca will be supplied with ferrosilicon and calcined dolomite by Kaiser Aluminum & Chemicals Corp., which signed a contract with General Services Administration when the Kaiser Magnesium Co. signed the lease on the plant. Kaiser will spend about $1.7 million to rehabilitate its ferrosilicon plant at Permanente, Calif., and its lime plant at Natividad, Calif.

Chemical Companies Receive AIM Awards for Management

Thirteen chemical companies are among the 238 firms throughout the United States and Canada that are being awarded certificates of management excellence for 1950 by the American Institute of Management, New York, according to Jackson Martindell, president of the non-profit foundation. The awards, to be presented annually hereafter by the institute, are based on its continuing study of more than 2,000 leading concerns—designed to provide a base for research into corporate policies and procedures.

Here are the 13 chemical companies honored: American Cyanamid Co., Dow Chemical Co., E. I. du Pont de Nemours & Co., Inc., Durez Plastics & Chemicals, Inc., Freeport Sulphur Co., Hercules Powder Co., Hooker Electrochemical Co., Interchemical Corp., Mathieson Chemical Corp., Monsanto Chemical Co., Pennsylvania Salt Manufacturing Co., Texas Gulf Sulphur Co. and Union Carbide & Carbon Corp.

In weighing the merits of each management, Martindell explains, credits are given for excellence in 10 separate fields: (1) economic function; (2) corporate structure; (3) health of earnings growth; (4) fairness to stockholders; (5) research and development; (6) directorate analysis; (7) fiscal policies; (8) production efficiency; (9) sales vigor; and (10) executive evaluation.

"The purpose of the awards," the AIM president declares, "is to encourage management in all lines of business to give due weight to all 10 fac-

tors, rather than to concentrate—as many do—on only one or two. For example, some firms are strong on research and development but lack unity of command within the organization. Others display real genius in financing, but have blind spots in dealing with personnel. Some are notable for aggressive, top-flight selling, but are not preparing younger men to take over when the present company heads retire.

"The fact that this year's recipients come from 25 states and 93 separate industries shows that sound management principles are applicable to all lines of business, wherever located. We hope that succeeding years will witness a further spread, with an increasing number of firms becoming entitled to the designation, 'Excellently Managed.'"

Institute Rubber Plant Goes Back on Stream

Production of synthetic rubber has begun at the giant Institute, W. Va., plant, W. S. Richardson, president of B. F. Goodrich Chemical Co., announces.

The job of reactivating the first unit in the world's largest single facility for the production of American rubber was completed in approximately 70 days. The plant has a rated capacity of 90,000 long tons of rubber a year, almost equal to one month's consumption in the United States.

Full production at Institute will be achieved by March. The B. F. Goodrich division also is operating for the government a 60,000-ton unit at Port Neches, Tex., which is producing in excess of its rated capacity.

B. F. Goodrich, which designed and built the first butadiene type man-made rubber plant in this country, is the largest single producer of American rubber for the government.

Utah Plant Being Converted To Process Uranium Ores

Formation of the Vitro Chemical Co. and its acquisition of the war-built Kalunite plant facilities has been announced in Salt Lake City. The plant, occupying some 80 acres in the city's southwest sector, was erected during World War II at a cost of $5 million for the processing of alumina from kalunite clays. Officials of the new concern, a subsidiary of the Vitro Manufacturing Co. of Pittsburgh, Pa., plan immediate conversion of facilities for the processing of uranium ores mined in Utah and on the Colorado plateau.

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The plant was acquired at an undisclosed sum from J. R. Simplot of Pocatello, Idaho, who purchased it from the War Assets Administration in 1947 for expansion of the region's fertilizer industry. A lack of anhydrous ammonia and sulphuric acid hampered full utilization of the plant for such purposes. Simplot is a vice president of the new Vitro Chemical Co., with W. C. Rickerson and A. J. Strod, both of Pittsburgh, Pa., listed as board chairman and president, respectively. Rickerson is likewise chairman of Vitro Manufacturing Co., a manufacturer of ceramic pigments and one of the nation's oldest uranium processing firms. Another Vitro Manufacturing Co. subsidiary, the Hellex Corp., participated in construction of the Oak Ridge, Tenn., installations.

In addition to refining substantial quantities of uranium ores, officials state "other chemical specialties and strategic materials" will be processed. With plant conversion scheduled immediately, initial extraction of uranium and perhaps vanadium may be possible by late this month or in March, since sizable stockpiles of ores are reported available in Utah's Marysvale district, where mining activities have increased considerably in the past year under AEC pressure.

Rickerson notes that S. R. Zimmerley, director of the Salt Lake branch office, U. S. Bureau of Mines, has contributed substantially to the solution of metallurgical and chemical problems arising from the character of Utah's autunite, tobernite and carnotite uranium-bearing ores.

Vitro Chemical Co. has been established with a capitalization of $500,000 of which $225,000 is subscribed.

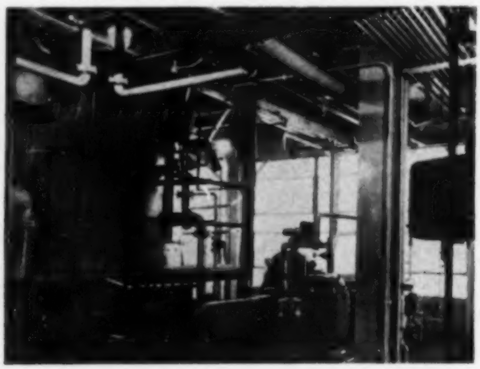
General Mills Moves Into Fatty Amine Production

A plant to produce amines, amides and nitriles from animal and vegetable oils will be built by General Mills, Inc., at Kankakee, Ill., where the company's Chemoil plant is located. The new unit will commence pilot operation this fall.

Designed by General Mills Research Laboratories, the plant is the culmination of an intensive research program. Its completion will mark General Mills' entry into the fatty amine industry. Since 1948, however, the company has been a major producer of vegetable oil fatty acids.

"The use of fatty amines in the flotation separation of mineral ores and in other applications is growing," declares Whitney Eastman, president of the company's Chemical Division. "In addition, the nitriles and amides promise to find entirely new uses through scientific development. Since General Mills produces fatty acids, key raw materials for fatty amines, amides and nitriles, manufacture of these products is a logical extension of our chemical business. We do not intend, however, to become merely another source of supply; we plan to build new products and to pioneer new applications."

FLAKING ROLLS ready cracked soybeans for extraction.



EXTRACTOR uses hexane to remove soya oil from flakes.

Inside Glidden's New Extraction Plant

Handling 250 tons of soybeans a day, the recently completed plant of the Glidden Co. in Indianapolis produces soybean oil and meal. Feature of the plant is the Rotocel extractor.

Arriving at the elevators in trucks and railroad cars, the soybeans are weighed and conveyed to the elevator silos. These have a total capacity of 1.5 million bushels.

From the storage elevator, beans go to the workhouse. Currents of forced air dry them as they fall down the workhouse tower.

A 250-ft. rubber conveyor belt, totally enclosed, moves the dried beans to the extraction building. First step in the extraction process is removal of foreign material and hulls. Cracking and air separation partially remove the hulls. Cracked beans, freed of hulls, are flaked by rolls. The flakes are about the size of large corn flakes.

Of new design, the extraction unit is called the Rotocel. This extractor, which extends from the second floor through the third, is pie-shaped with wedge-like baskets. The baskets, filled with soya flakes, rotate during the extraction process.

Sprays of hexane flush each basket of flakes. This removes oil from the beans.

The solution of oil in the hexane is pumped from the extractor to a distilling system where the hexane is distilled off, leaving the soya oil.

Flakes from the extraction column are conveyed to a dryer where all the hexane is removed by heat. Dried flakes are then toasted to a golden brown to increase their digestibility and nutritive value. After cooling, the flakes are ground to form a meal and soya flour.

Much oil from the new Indianapolis

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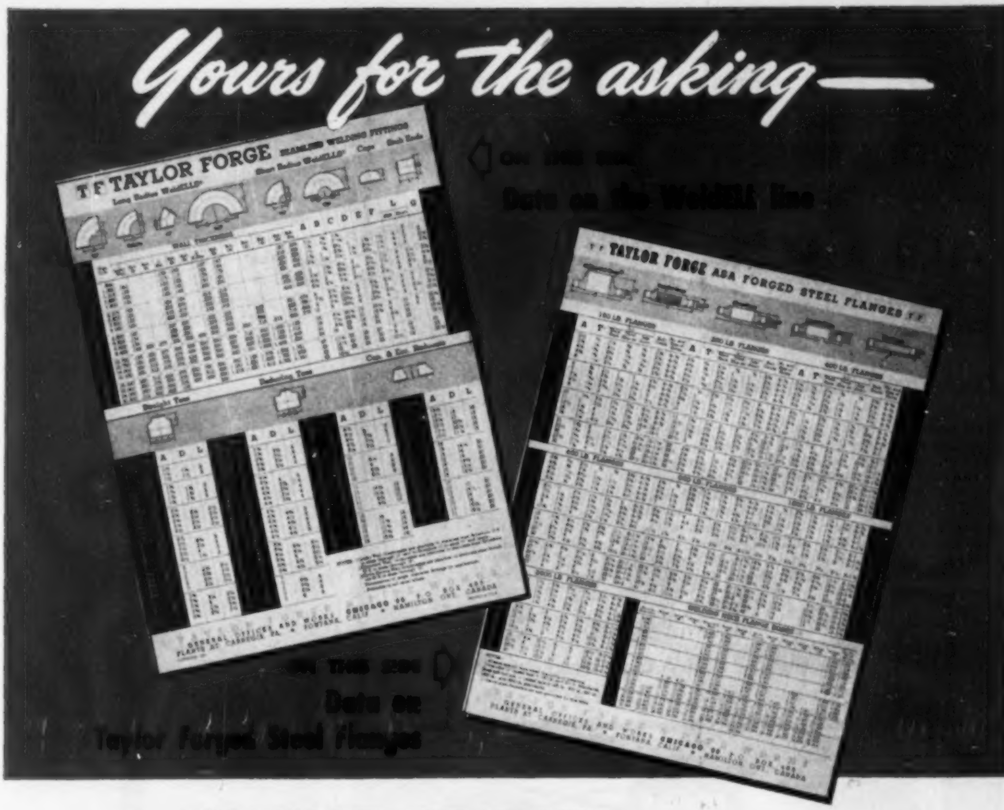

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plant is shipped to Glidden's vegetable oil refinery at Louisville, Ky. About 40 percent of the meal is processed at the Indianapolis feed mill of the company. The rest is sold to feed mills and oil refineries throughout the Midwest.

Buildings at the Indianapolis plant are constructed of concrete, face brick and glass. Interiors of processing buildings have glazed tile walls to insure cleanliness. All equipment and machinery have been painted in a pleasing color scheme.

Saves $100, 11½ Hours

Next time you paint your plant's smoke or fume stack, remember this little trick thought up by plant manager Russell L. Miller at Monsanto's plant in Everett, Mass.

Usual way: Construct scaffolding by lashing a succession of light ladders to the stack until the top is reached. Allow about 12 hours for this job on a 150-ft. stack.

Monsanto way: Equip a helicopter with staging hook, block and falls, and other equipment. Have the pilot hold the helicopter steady while the steeplejack drops his staging hook atop the stack, then leisurely plays out block and falls until they are in correct position. Aground again, the steeplejack goes to the base of the stack, slips into his bos'n's chair attached to the rigging, and is ready to

go up to his work. Allow ½ hr. for this job.

Net benefits: A saving of 11½ hr. and $100 for a 150-ft. stack. And the time saved was more important than the money, according to Miller, for the plant had to be shut down during the operation.

Alcoa Adding Pot Lines At Point Comfort Works

An even larger expansion of its Point Comfort Works at Port Lavaca, Tex., than previously envisioned is now planned by Aluminum Co. of America. Two new pot lines will be constructed; this means an additional 76 million pounds of aluminum annually. Cost of the new reduction facilities will approximate $15 million. Construction will start as soon as contracts can be arranged and building materials and equipment obtained.

The Point Comfort Works began production of aluminum pigs a year ago. The three pot lines in the plant at that time had an annual capacity of 114 million pounds. Capacity of the enlarged plant will be about 190 million pounds. Two new powerhouses will be included in the new construction. Each pot line will have its own power plant. A plant consists of 40 engine-generator units.

Carbon Black Plant Going Up Near Oil Field in Louisiana

Cabot Carbon Co., a subsidiary of Godfrey L. Cabot, Inc., plans immediate construction of a carbon black plant near the Bayou Sale oil field in St. Mary's Parish, Louisiana. The plant is to cost $4 million.

One unit, a thermal black plant using natural gas as the raw material, will have an annual output of 30 million pounds. Adjoining it will be an oil furnace carbon black plant, using petroleum byproducts, with an annual capacity of 50 million pounds. The two plants together will increase the present production in Louisiana by 55 percent.

A plant site has been acquired, and negotiations reportedly have been completed for a natural gas supply for the thermal black plant and for the raw material for the oil furnace plant. This latter will process liquid hydrocarbons, residue oils and tars.

Conservation Commissioner S. L. Digby at Baton Rouge says, however, that no application has been made by the company yet for the required permit to use natural gas in carbon black manufacture. Since it's been the state's policy for many years to issue

(Continued)

such permits only where gas that otherwise would be wasted is to be used, it is assumed that Cabot Carbon intends to use the several billion cubic feet of casinghead gas produced annually with the oil at the Bayou Sale field. Currently, it's burnt in flares for lack of a market.

"Thermal blacks," according to Cabot Carbon, "will be produced for the rubber manufacturing industry. Some part of the total thermal black production is to be further processed into a high-purity metallurgical carbon of proved performance in increasing the production rate of steel. This new Cabot development is also a preferred raw material for the manufacture of specialty electrodes."

"The oil furnace black unit will represent an important addition to the supply of furnace carbon blacks made necessary by increasing volume of 'cold' synthetic rubber required by the government's recently expanded synthetic rubber program.

"If the anticipated rapid construction schedule for the new plant can be met, it will help avert the possibility of shortage of tires, tubes and other manufactured rubber products dependent on synthetic rubber-oil furnace black combinations."

Huber Doubling Capacity Of New Carbon Black Plant

J. M. Huber Corp. has modified its plans for the new plant under construction at a site, several miles north of Baytown, Tex., to be known as Aromex. Original plans called for a plant capacity of 36 million pounds of HAF type carbon black annually, the plant to cost $1.5 million. The enlarged plans are for a plant capacity of 72 million pounds. The cost too will be doubled.

First unit will go into production late this spring, and the other unit in the fall or winter. Huber now operates a channel black and a furnace black plant at Borger, Tex.

Industrial Alcohol Cheaper From New Mold Process

U. S. Department of Agriculture scientists have developed a method for getting industrial alcohol from grain by a new mold process at less cost than by the traditional malt process.

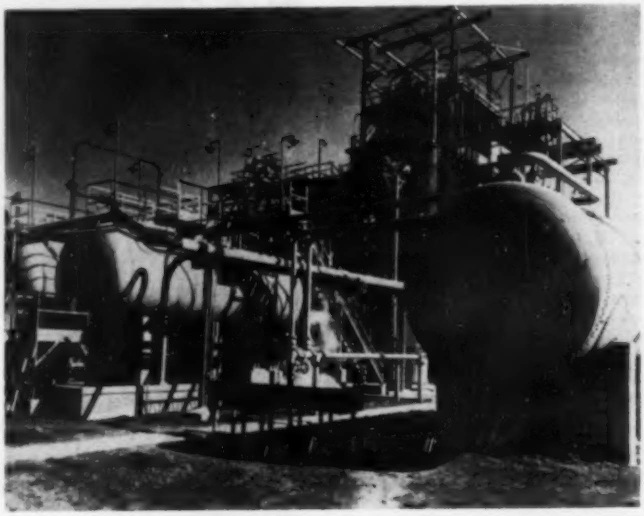
Commercial-scale experiments at an Iowa distillery show that a plant using 12,000 bu. of grain a day could save more than $1,000 in each day's operation by shifting to the new process. It uses fungal amylase, a mold product, in place of malt.

The fungal-amylase process was developed first on a pilot-plant scale by the Bureau of Agricultural & Industrial Chemistry at the Northern Regional Research Laboratory, Peoria, Ill.

So far, tests show that yields of alcohol with fungal amylase from either sound or heat-damaged corn are at least equal to yields obtained when malt is used. USDA thinks its experiments show that use of fungal amylase is practical. Only minor additions and alterations are made in distillery equipment and procedures.

The mold enzyme had no adverse effect on distilling operations or on the quality of the alcohol. Byproduct livestock feeds were practically identical with those from the usual malt process and have the same feeding value as malt feeds.

Research to improve further the process is continuing at the Northern Laboratory.



Esso Sells Buna-N Plant to U. S. Rubber

United States Rubber Co. has purchased the Buna-N synthetic rubber plant of Esso Standard Oil Co. in Baton Rouge, La., as a major step in expanding its facilities for the manufacture of chemicals, plastics and synthetic rubbers. Purchase price was not disclosed.

The plant will be operated by U. S. Rubber's Naugatuck Chemical Division, which will continue to produce and market Buna-N rubber under the former Esso trade name of Paracril.

John P. Coe, vice president and general manager of Naugatuck, gives three reasons for the purchase: (1) it provides a growing business in Buna-N synthetic; (2) it increases the company's capacity to produce high styrene copolymer latex; and (3) it provides added production facilities for U. S. Rubber's new plastic-rubber blends.

Right now, the plant has the capacity to produce about 15 million pounds of Buna-N and high styrene latex annually. U. S. Rubber plans to expand capacity so the plant will manufacture more than 30 million pounds of Buna-N, high styrene latex and the new rubber-plastic blends annually.

In 1941 the plant started producing Buna-N. Successful operation of this plant provided the basis for the design of the Buna-S plants later incorporated in the government's synthetic rubber program for the manufacture of GR-S, the official designation for synthetic rubber used in tires. The first batch of GR-S produced in the United States was made at this plant in December 1941 under a cooperative program by technicians of Esso and U. S. Rubber. Since then, it has produced almost exclusively Buna-N specialty rubbers.

Continued operation by Esso for the government of the plants producing butyl rubber, used in inner tubes, is not affected by this sale.

This is the second major expansion by Naugatuck during the past year.

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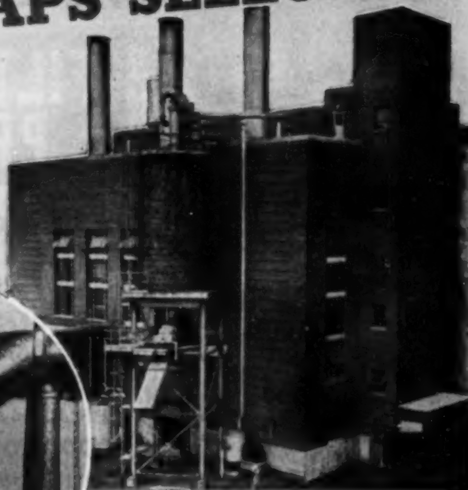
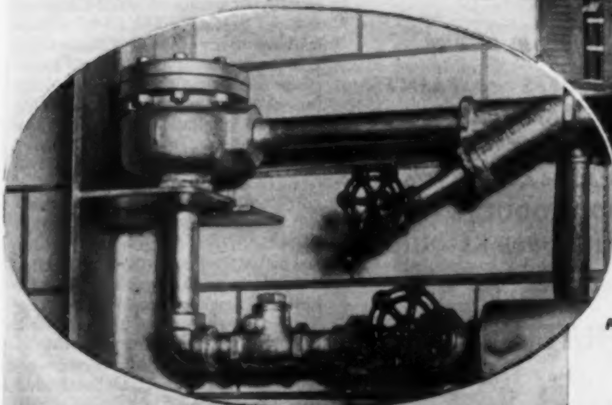
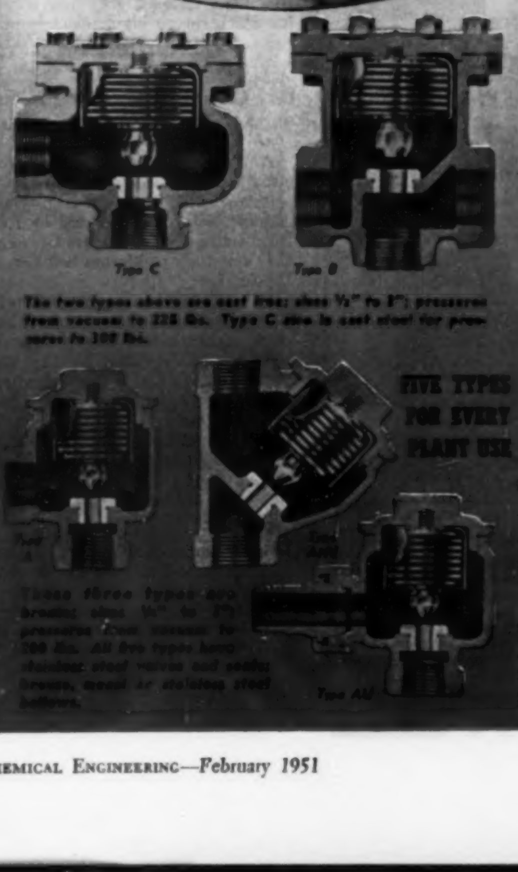
NICHOLSON TRAPS SELECTED

for Jeffrey's Ultra-Modern Boiler Plant...





Above, the new ultra-modern boiler house of Jeffrey Manufacturing Co. at its Columbus, Ohio, plant. Specified were Nicholson Steam Traps, one installation of which is shown at left returning main steam header condensate to heater.



As leading makers of power house equipment, when The Jeffrey Manufacturing Co. set out to build a new boiler house for their own 48-acre plant in Columbus, Ohio, the project obviously became a subject of peculiar pride. Recently completed at a cost of over a million dollars to handle steam loads up to 180, 000 lbs. per hour, the new plant is saving $40,000 annually.

Since Jeffrey's new plant is considered probably the most modernly equipped, the choice of Nicholson steam traps is naturally significant. A recent survey showed these Nicholson features to be reasons why an increasing number of leading plants are standardizing on Nicholson thermostatic traps: 2 to 6 times average drainage capacity; shorten heat-up time. Operate at lower temperature differential; fast action keeps equipment full of live steam. Maximum air-venting capacity. Types for every process, power and heat application.

Catalog 250 contains capacity tables, installation diagrams, and data, charts and formulae for determining the proper size trap.

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NEWS, cont. . .

On Dec. 31, 1949, it acquired the Painesville, Ohio, vinyl resin plant of Glenn L. Martin Co., together with the trade name Marvinol and laboratories in Baltimore, Md. This marked Naugatuck Chemical's entry into the vinyl plastics field as a primary producer.

Barrett Boosts Phthalic Capacity in Chicago

Barrett Division of Allied Chemical & Dye Corp. will build a $4.5 million addition to its plant in Chicago, Ill. Prime purpose of the project: to increase substantially Barrett's capacity for phthalic anhydride, now being made at its Philadelphia, Pa., and Ironton, Ohio, plants. Added refining facilities and a new power plant will be included in this project.

It's estimated that the expansion will add about 14,000 tons a year to Barrett's output of phthalic. Starting raw material, of course, is naphthalene.

The new phthalic anhydride facilities at Chicago will be in volume production by the end of 1951. They'll enable the company to meet the increasing demand for this chemical in the important Chicago-Detroit industrial area. Phthalic goes into alkyds, for which there's big demand in plastics and coatings.

Bay Chemical Building Plant To Make Cracking Catalyst

A new plant, embodying new processing techniques in the production of catalyst used in making high-octane gasoline, will be constructed by Rust Engineering Co. for the Bay Chemical Co., a division of Morton Salt Co., at Weeks, La.

Contract for the new installation includes process design, engineering and plant construction. The process design will be furnished by the Rust Process Design Co., a Rust subsidiary.

A high-quality catalyst, used in fluid catalytic cracking processes, will be manufactured at the new facility by means of a new process based on extensive development work carried on by the Bay Chemical Co.

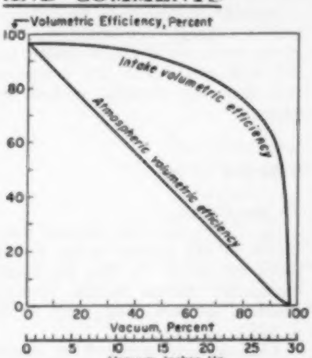
Propane barge, world's first exclusively designed to haul that hydrocarbon, was launched recently at the Beaumont, Tex., shipyards of Bethlehem Steel. The 195-ft. vessel has a 44-ft. beam, and a depth of 10½ ft. It's the first barge equipped with multi-cylindrical tanks, made up of sections pressed together to withstand the pressure under which pro-

pane must be kept. The barge carries six of these tanks, in tiers of three, with a total capacity of 360,000 gal. It will ply between the pipeline terminals of Warren Petroleum Co. at Houston, Tex., and that company's distributing center at Mobile, Ala., over the Intracoastal Canal.

Streamlined pulp mill is the goal of a $3.6 million modernization and expansion at the St. Helens, Ore., plant of St. Helens Pulp & Paper Co. To take two or three years, it will boost capacity from the present 175 tons to 225 tons daily. What's planned: installation of another digester; increased chipping capacity; new wet presses; reconstruction of a paper machine for higher speeds; a multi-stage pulp bleaching unit; added causticizing equipment; and facilities for recovering paper shred.

High-octane fuels for aircraft will come from the Texas City, Tex., refinery of Petrol Refining Corp., which is now being reactivated. The plant, which includes a Houdry catalytic cracker, has been shut down for more than a year. It was purchased from the government in October 1947.

READERS' VIEWS AND COMMENTS



Volumetric Efficiency of Vacuum Pumps

In June (p. 108-110) we published "How to Figure Reciprocating Vacuum Pumps" by Tyler Hicks. He gave a stepwise method of calculating pump-down time with reciprocating vacuum pumps. It was based on the use of the pump's volumetric efficiency curve which was averaged in each of a dozen short intervals as the pressure was reduced. Unfortunately, the type of volumetric efficiency used

(Continued)

was not specified. This led to a certain amount of confusion.

Mr. Hicks points out that volumetric efficiency can be expressed in two ways. If the volumetric efficiency at any pump intake pressure is expressed as the ratio of air handled, to pump cylinder displacement, with the air taken at atmospheric pressure and intake temperature, the volumetric efficiency is known as atmospheric volumetric efficiency. If, instead, the volume of air handled is expressed at intake pressure, as well as intake temperature, that is known as intake volumetric efficiency. The curve above shows how the two methods of expressing volumetric efficiency would appear as plotted for the same pump.

Customarily, reciprocating vacuum pump makers have tended to use the first, or atmospheric volumetric efficiency; rotary pump makers, however, generally use intake volumetric efficiency. For the stepwise method Mr. Hicks used atmospheric volumetric efficiency since, as the curves show, it would be extremely difficult to read the intake volumetric efficiency curve with accuracy in the higher vacuum ranges, while the atmospheric volumetric efficiency plots as almost a straight line.

Commenting on the Hicks method on p. 125 of our September 1950 issue, E. F. Johnson, Jr., showed that a simple formula based on the assumption of a straight-line volumetric efficiency curve could give a similar result with considerably less computation than the stepwise method requires.

Rebuttal

To the Editor:

Sir:—There are a few germane comments on two Letters to the Editor about my article "Is This the Small Company's Answer to the Pension Problem" (*Chem. Eng.*, Aug. 1950, p. 125).

The concern expressed is chiefly that:

1. The plan features avoidance of actuarial valuations.

2. No cost balance is ever obtained when provision is made for a stated rate of contribution and a fixed benefit.

3. The Bureau of Internal Revenue has not yet approved (or disapproved) as "qualified" plans a scheme of benefits and an unrelated schedule of contributions.

Let us take the above propositions and comment upon them:

1. Actuarial computations upon which the stated rate of contributions

(*Continued*)

KEEPING pace with today's increasing production tempo requires better, higher capacity machinery. There is no place for outmoded methods and equipment.

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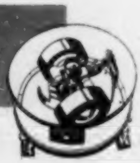


are based is designed in each case to provide the necessary funds for full retirement benefits for all employees age 40 years or older expected to attain age 65 and eligible to and who retire at that time. Retirement is assumed at age 65 although employees, otherwise eligible, may elect to and return any time after 65 years of age up to age 70. Any appreciable retirement experience beyond age 65 tends to improve the financial position of the fund in relation to its estimated liabilities.

2. On Nov. 9, 1950, the Commissioner of Internal Revenue issued his first public Ruling on negotiated pension plans. PS No. 64; in which it was ruled that the definiteness of a plant is not adversely affected merely because it provides a fixed benefit and a stated rate of contributions.

3. It would have been more accurate had he stated that "approval" or "disapproval" of nearly all negotiated pension plans have been held in abeyance, during the past several months, pending issuance of the current Ruling PS No. 64.

In negotiated pension plans the question of whether the union contract term limitation violates the requirement that a qualified plan must be permanent as distinguished from a temporary program. On this question the commissioner ruled that for the purposes of 165(a) the plan is permanent and meets the requirements in this respect. Recognizing, as he did, that renegotiation of the union contract might result in maintaining the plan without change, or in modifying it, or in terminating it, in this respect, the commissioner stated, the instant plan is similar to plans generally—in that they all contain provisions for amendments or discontinuance. Thus the plan, as far as can be ascertained at its inception, is intended as a permanent program within the purview of 165(a).

The commisisoner also noted in particular that since the benefits of the plan are limited to hourly rated employees (in the bargaining unit) the plan could not possibly discriminate in favor of officers, directors, supervisors, or other highly paid employees, whether the plan is continued or terminated. Therefore, since the plan meets all the requirements, rules the Commissioner, set up under 165(a), including those of definiteness and permanency, the plan qualifies and the trust is exempt from income tax on its earnings.

From the above it would seem that the point of "approval" or "disapproval" of the District 50 Plan was not well taken. Mr. Bronson might

not have written the same letter or in fact any letter had he known the contents of the commissioners ruling on this matter.

A negotiated pension program such as the District 50 Plan will by its very nature be reviewed from time to time by the company and union in periodical negotiations. Experience under the plan will be reviewed in the light of original and current estimates and such modifications as may be advisable and agreed to by the parties may be adopted. Do not all pension plans need review and re-examination from time to time? The District 50 Plan is no exception to this rule. The method may be different but the method of establishing a negotiated pension plan is also different than the method of establishing a unilateral plan.

I feel fully justified in having stated in the previous article that "The program is the least complex of any we have encountered and provides maximum security for employees with minimum risk for management." And finally, "yet, in this instance and in all others we've studied, the program has proved actuarily sound."

P. F. Broderick
Industrial Associates, Inc.
Cleveland, Ohio

Contributors Wanted

To the Editor:

Sir:—A file of back numbers of both *Chemical and Metallurgical Engineering* and *Chemical Industries* is urgently needed here. The former, particularly, is needed in connection with both teaching and research here at the Institute. And there is not a file of this magazine in the whole country in any of the institutions of higher education.

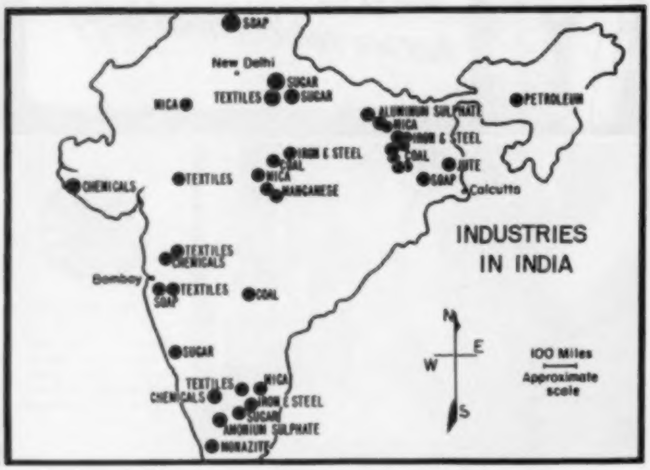
I wonder whether among the many readers of *Chem. & Met.* there may not be someone with back numbers standing uselessly in some garret or basement, and wistfully waiting for somebody to bring them out into the light again. If so, I promise to give them a good home with plenty of exercise.

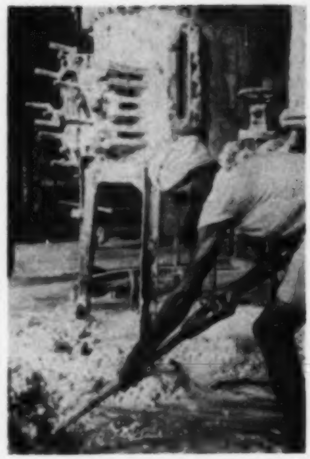
Anything that you can suggest would be most welcome to the faculty and students here and no less to a growing group of young chemical engineers in this oldest of countries and newest of nations.

M. Merlub-Sobel
Associate Professor
Institute of Technology
Haifa

Note: *Any offers? Address correspondence to Dr. Merlub-Sobel, not to* Chemical Engineering. *His address: P. O. Box 910, Israel.*—Editor.

News From Abroad **Special Correspondence**





Process industries are growing throughout India despite crude facilities like those in the southern caustic plant shown above.

Here's India's Stake in a Chemical Industry

S. C. Dholakia, *graduate of the University of Bombay, research fellow in Purdue's chemical engineering school.*

The Indian chemical industry was born and reborn during the two world wars. Present rate of growth promises continued life. How soon it reaches man's estate depends on how much technical and financial aid is forthcoming from the outside.

The country has the natural endowments and has laid groundwork for expansion. Raw materials such as vegetable oils, thorium-rich monazite sands, lac, hides, manganese ores and mica abound. Present conditions destine most of them for export. Manpower and markets are latent in the population of 340 million (which now yields only 150 chemical engineers a year). The government has gone to work and established a chain of national research laboratories for chemistry, physics, fuels, glass and ceramics, metallurgy, drugs, leather, food and electrochemistry; restrictions on foreign investors have been relaxed. Many branches of the industry have begun to tap the tremendous potential in materials, manpower and markets.

Heavy Chemicals—Chamber process is widely used to produce sulphuric acid however contact plants are on the increase. Sulphuric-based industries have been stunted by India's lack of elemental sulphur. Prime source is chalcopyrites, part of which is imported. Some Indian coals contain 4-5 percent sulphur but no commercial recovery process has yet been worked out. Gypsum, available in large amounts, is being used at a rate of 350,000 tons a year to produce ammonium sulphate and cements in a Sindri plant (Bihar, East India), the largest in Asia.

Heavy Chemicals	Production M Tons/Yr.	Consumption M Tons/Yr.
Sulphuric acid	60	70
Caustic soda	10	80
Soda ash	74	100
Nitric acid	....	1.3
Bichromates	4.8	2
Bleaching powder	4.2	12
Ammonium sulphate	30	100

Abundant electric power and common salt are available for caustic soda production. Disposal of byproduct chlorine is a problem since no organic chemicals are being produced. Some chlorine is consumed for bleaching powder for the textile industry. The alternative at present is causticization for which limestone is plentiful.

Foreign competition and technical difficulties hamper soda ash production. India has a surplus of bichromates which she exports and large deposits of potassium nitrate to help her agricultural development projects.

Organic Chemicals—Dyes and plastics production is nil because coal tar has not yet been distilled economically. Since India produces textiles for export, 13-15 million worth of dyes must be imported yearly. Wood distillation and fermentation of molasses and vegetable oils are promising sources of organic chemicals; petroleum supplies are very insufficient.

The drug and pharmaceutical industry is fairly well established though some of the important drugs like aspirin (consumption: 90,000 lb. per yr.) has not been attempted. Production of sulfa drugs has started. Vitamin A is obtained from shark liver oil commercially. India's plentiful supplies of medicinal plants offer tremendous scope for expansion.

Production of insecticides, pesticides and plant chemicals cannot yet begin to keep up with the fast-growing demand.

Metals—Coal, iron ore and limestone all occur in the same district in eastern India. One of the largest undertakings in Asia, the Tata Iron and Steel Works Ltd., has grown up there. Aluminum production from a 250,000-ton bauxite deposit has just begun. The 6,000-ton output of copper does not meet demand. More is expected on the basis of imported pyrites which would also yield sul-

(*Continued*)

phur. Ferrosilicon consumption is just double the 2,000-ton-a-year production mark. Manufacture of ferrous and nonferrous alloys will have to be undertaken to meet increasing demand. Raw materials are available for expansions in all these fields.

Consumers' Industries—Here supply and demand figures pretty nearly balance out. About a thousand factories produce soap; glycerine is recovered in some. Modern equipment and high efficiency are the rule in the portland cement, sugar and hydrogenated oils industries. Difficulties in transporting fuels and raw materials are keeping glass production down to half the demand. Pulp and paper consumption is on the increase as a result of recent literacy campaigns. Full-scale manufacture of newsprint from bamboo has just started up. Raw materials for paints, varnishes, pigments and enamels are plentiful and the industries are well established.

Consumers' Products	Production M Tons/Yr.
Soap	100
Cement	1,600
Sugar	1,078.8
Glass	150
Paints& enamels	50
Lithopone	4

Two factories for production of rayon are operating with a total annual capacity of over 2,500 tons. India is second only to Hollywood in production of photographic film base.

Natural Resources—India maintains her trade balance by exporting raw materials on which domestic industries may be based in the future. In 1947-48 about 4.6 million tons of oilseeds (50 percent peanuts; sesame rape seed, flaxseed, mustard, castor beans) were produced; 103,314 tons in terms of oil was exported. Domestic users include the soap, hydrogenated oils, paints and varnish industries.

India has a virtual monopoly on lac in the world market with the U. S. its largest consumer. Production of shellac amounts to about 30,000 tons a year. A research institute is devoted just to investigations of the use and modification of lac particularly in relation to synthetic plastics. A few molding plants are the only evidences so far of a plastics industry. Cashew shell liquid and bhilavan, important because of their phenolic contents, occur naturally but in hard-to-reach areas.

Next to the U.S.S.R., India is the world's largest producer of manganese ore. Most of the 448,000 tons produced in 1947 was exported to the U. S. Mica production in 1947 was over 6,000 tons—largest in the world. Raw materials for titanium white are estimated to 3,000 tons. With over 126 million cattle, India does a large

export business in hides and skins and has recently begun to develop her own leather industry.

In south India is one of the largest reserves in the world of monazite sands rich in thorium minerals. A processing plant with $1 million capital is about to start operations.

Reported This Month . . .

GREAT BRITAIN

An aureomycin plant nearing completion by Cyanamid Products Ltd. at Hirwaun Industrial Estate, near Merthyr Tydfil, will meet Britain's domestic demands and leave a surplus for export. Crude aureomycin imported from the United States will be purified and packaged. The company is considering the possibility of erecting another plant to undertake complete manufacture.

Contact plant to utilize pyrites is being built by the West Norfolk Farmers' Manure and Chemical Cooperative Co., Ltd. of King's Lynn and Boston. Freeman Nichols flash roasters will produce the sulphur dioxide gas: ground pyrites will be blown into hot combustion chambers and burned. The plant will be near the company's existing chamber works on the River Nar.

Refinery project of the Anglo-Iranian Oil Co. is under way in Kent. It will include a crude oil topping unit with gasoline stabilizers and copper chloride sweetening plant, as well as lube oil plants with units for vacuum distillation, propane deasphalting, furfural extraction, dewaxing and clay contact. E. B. Badger & Sons (Great Britain) Ltd. is over-all coordinating contractor for the job, scheduled for completion early in 1952.

SOUTH AFRICA

Pulp and paper mill in Natal is planned by combined South African, Canadian and British interests. Slated for an initial output of 100 tons a day of kraft grades of paper, the plant will use the sulphate process. Eventually both kraft and white paper will be made. South African Pulp and Paper Industries Ltd. will run the plant.

For effluents of fermentation industries an anaerobic digestion process has been developed by the Council for Scientific and Industrial Research. Tests on pilot plants have shown the processed water to be pure enough to be returned to streams.

(Continued)

Uranium to be produced here as a byproduct of gold will be sold to the United States and the United Kingdom under an agreement just concluded by the three nations. Plant design and construction is proceeding on an urgent basis.

CANADA

Zinc refining and fertilizer producing facilities will be increased by a $15 million construction project of Consolidated Mining & Smelting Co. A $3.2 million addition to its electrolytic zinc refinery at Trail, B.C., will increase production by about 70 tons daily. Ammonium phosphate at a rate of 70,000 tons a year is to come from the $9 million fertilizer plant to be built at Kimberly, B. C.; a 300-ton-a-day output of sulphuric acid will result from treatment of tailings from the company's Sullivan mine. The acid, in turn, will be used to treat phosphate rock from its Montana mines.

Atomic energy pile, third in Canada, will get under construction next August at Chalk River near Ottawa. It will be a heavy water moderated reactor and will add about $30 million to the $40.4 million Canada has already spent on its Chalk River atomic energy project.

Synthetic rubber prices have been raised by the government-owned Polymer Corp. at Sarnia. General purpose GR-S moves up from 18.5 to 24.5 cents a lb.; butyl rises to 20.75 cents having moved from 18.5 to 20.35 cents last September. These increases are the first since 1946.

Canada does not plan to control rubber supplies. The Polymer Corp. is producing 60,000 tons of synthetic rubber a year, enough to meet domestic requirements with a surplus for export. Any shortages of natural rubber can be made up by synthetic supply, according to officials.

Catalytic cracker with auxiliary gas recovery plant and a vacuum distillation unit are to be installed at the Edmonton refinery of Imperial Oil Ltd. The cat cracker, designed by Standard Oil Development, will be the first of its kind in the world. Each of the two units will have a capacity of 10,000 bbl. a day; they will increase production of high-octane gasolines.

Vermiculite deposit, the first commer-

(Continued)

Do you know about WOLVERINE TRUFIN* Condenser Tube?

Wolverine Trufin Condenser Tube

*Reg. U. S. Pat. Office

DO YOU KNOW–

. . . that it is an engineered finned tube with the fins extruded from the tube wall?

. . . that it will replace plain surface tube without any alteration to heat exchangers?

. . . that the increased ratio of outside to inside surface will more than double the performance of plain surface tube in many cases?

. . . that it is available in the same alloys as plain surface condenser tube?

. . . that it provides an economical substitute for plain surface tube in many applications?

. . . that it has generally less pressure drop on the fin side than plain tubes on the same center distance?

. . . that the plain ends are heavier than the body of the tube even when rolled in header and results in a stronger unit construction?

. . . that although body of tube is tempered for rigidity the ends are of annealed temper suitable for rolling in header?

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ont.

Do you know that Wolverine also makes plain surface condenser tubes in a wide variety of alloys?

Wolverine Plain Condenser Tube

Admiralty 70-29-1 • *Brass 70-30* • *Nickel Aluminum Bronze 92-4-4*
Arsenical Copper • *Red Brass 85-15* • *Cupro-Nickel 30%, 20% and 10%*
Aluminum Brass 72-22-2 • *Aluminum Bronze 95-5* • *2 & 1 Brass* • *Muntz Metal*

WOLVERINE TUBE DIVISION

Calumet & Hecla Consolidated Copper Company

INCORPORATED

Manufacturers of seamless, non-ferrous tubing

1427 CENTRAL AVENUE DETROIT 9, MICHIGAN

PLANTS IN DETROIT AND DECATUR, ALA.

Sales Offices in Principal Cities

cially usable one in Canada, has been discovered at Stanleyville, about 60 miles southwest of Ottawa. Yearly imports, principally from the U. S. and South Africa, have amounted to $250 million and the market is increasing.

Ethylene glycol and ethylene oxide will be made at a Dominion Tar and Chemical Co. plant under construction in Montreal East, Que. This is part of a $5 million plant expansion program which also calls for substantial increases in facilities for phthalic anhydride.

Argon manufacture has commenced in Canada at Canadian Liquid Air Co.'s new plant in Hamilton, Ont. Some 500 cylinders are in service. Until now the gas has been imported from the U. S.

MEXICO

Ammonium sulphate fertilizer works costing $10 million has gone into action outside of Mexico City. Daily output is 200 tons plus 50 tons of sulphuric acid byproduct. It uses sulphur extracted from natural gas piped from the Poza Rica fields. Facilities for steam, power, water and sewage disposal are on the premises.

Blaw-Knox Co. directed construction of the plant. Chemical Construction Corp. designed it and bought $4.5 million worth of equipment for it in the United States.

Run by a government firm headed by Carlos Benitez, it is the first operation of its kind in the country. Its 70,000-ton yearly output is headed for Mexico's worn farm lands. It will cut the cost of ammonium sulphate, all of which had to be imported before, from $93 to $41 a ton.

AUSTRALIA

Zinc oxide, to be followed later by other pigments for the rubber, paint and plastic industries, will be produced at a plant at Braybrook, Victoria, which has just been completed by Durham Chemicals Australia Pty. Ltd.

Printing ink for printing on sheets or molded articles of polythene with ordinary equipment has been developed by Imperial Chemical Industries of Australia and New Zealand Ltd. It consists of a 2 to 1 mixture of Alkathene (a polythene) and polyisobutylene as film-forming medium which is dissolved in a mix-

ture of equal amounts of tetrahydronaphthalene and trichlorethylene.

Argon-shielded arc-welding has taken firm hold in the chemical and food processing industries since the advent a short time ago of high-purity argon to Australia. Applications range from welding of aluminum dope buggies in the explosives plant of Nobel (Australia) Pty. Ltd. to fabrication of large stainless steel tanks of the Emu Brewery Co.

FRANCE

Rayon staple exports to the United States reached a record 5,307 tons (10 percent of current production) during the first nine months of 1950. Under the nation's Monnet Plan for industrial development, total output is slated to go up to 72,000 tons by 1952-53. However, this program is threatened by raw materials shortages which are also expected to force up prices of exports in 1951.

Oil deposit explored at Lacq, near Pau, early last year by the Societe Nationale des Petroles d'Acquitaine has become France's biggest crude oil supplier. Recent output has averaged over 8,000 tons per month and predictions are that it will be doubled with ease.

NORWAY

New foam fire-extinguishing fluid is being produced from fish-waste, animal hair and byproducts from a fish-meal factory and tanneries. The plant, Tosse Fiskemelfabrikk, at Brattvag, will meet the needs of the home market with a daily production for 1,000 kg.

Magnesium production is about to begin at the A/S Heroya Elektro-Kjemiske Fabrikker plant at Heroya. Initial capacity is 3,000 tons, mostly for export. The eventual aim is to produce 18,000 tons of magnesium oxide: 10,000 tons to be used in metal making; the balance for building and refractory materials.

New urea plant of Norsk Hydro is in full production at Heroya. It is turning out 30 tons of crystals daily. Capacity is enough to cover Scandinavian needs with 5,000 tons to spare for exporting outside the area. Part of the output is destined for manufacturing fertilizer with very high nitrogen content for shipping to markets where high freight costs are otherwise a barrier. —*End*

SIX POINTS . . .

1. Is the substance included in the commodity list by name? If not, is the classification of the product listed—for example, cleaning fluid, corrosive liquid, etc., on pp. 42 to 57 of the regulations?

2. If not listed by name or class, does it come within the scope of any of the definitions of dangerous articles? Check with the tabulation accompanying this article. If there is still doubt as to whether the compound should be included in any one group of dangerous articles, compare its hazards with those of known compounds in the group.

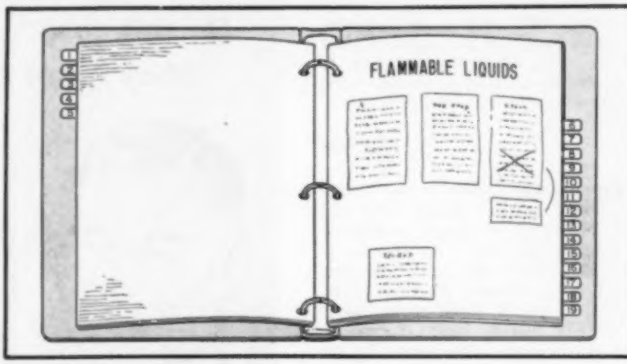
3. As a last resort, refer the question to the Bureau of Explosives.

4. Instructions regarding shipping papers and marking and labelling of packages are on pp. 106 to 110A.

5. Import and Export shipment regulations are on pp. 58 and 58A.

6. Miscellaneous matters such as return of empty containers, reuse of containers, rail express limitations, placarding of cars, qualifications maintenance and use of tank cars, portable tanks, cargo tanks, etc. are on pp. 59 to 62.

A FILING IDEA . . .



WHAT TO DO: Put regulations in loose-leaf notebook. Label tabs as per this keyed listing of ICC's classifications and page numbers:

1. General, p 39
2. Commodity List, p. 42
3. Explosives A, p. 63
4. Explosives B, p. 71
5. Explosives C, p. 74
6. Flammable Liquids, p. 75
7. Flammable Solids, p. 80
8. Corrosives, p. 88
9. Compressed Gases, p. 95C
10. Poisons A, p. 101
11. Poisons B Liquids, p. 103
12. Poisons B Solids, p. 104
13. Poisons C, p. 105B
14. Poisons D, p. 105C
15. Marking & Labelling, p. 106
16. Container Specs., p. 111
17. Carriers Regulations, p. 157C
18. Express, Baggage, p. 177
19. Index, p. 181

Shipping Dangerous Chemicals

Here's a key to efficient use of ICC regulations governing dangerous chemicals. What is a dangerous chemical? See the commission's definitions, p. 236.

The necessity for the regulation of the transportation of dangerous articles in the interest of public safety has been illustrated by the explosion of mines and high explosives at South Amboy, N. J. as well as the Holland Tunnel, N. Y., explosion in which carbon bisulphide was involved. There are indications in both instances that regulations were violated. Congress recognized this need back in 1908 when it enacted legislation which was subsequently amended on March 4, 1921. This act has been generally known as the Explosives Act. It was amended by the statute known as the Dangerous Cargo Act, Public No. 809, 76th Congress and approved on Oct. 9, 1940.

The ICC was directed by this law to formulate regulations for the safe transportation of explosives and other dangerous articles, specifically including flammable liquids and solids, oxidizing materials, corrosive liquids, compressed gases, and poisonous substances. These regulations are binding upon all common carriers engaged in interstate or foreign commerce both by land and by water. The commission is authorized either of its own volition or upon application of any interested party to make changes or modifications in said regulations which may become desirable because of changed conditions or discovery of new data. Such regulations shall be in accord with the best known practical means of securing safety in transit covering the packing, marking, loading, handling, while in transit and the precautions necessary to determine whether the material when offered is in proper condition to transport. It is specified that the regulations and all changes therein, unless otherwise noted, shall take effect 90 days after publication and shall remain effective until reversed, set aside, or modified by the commission.

This act is binding on all common carriers engaged in interstate or foreign commerce as well as on all shippers making shipments via such carriers. Whoever knowingly violates the act or the regulations promulgated by the ICC shall be fined not more than $2,000, or imprisoned not more than 18 months, or both. If death or bodily injury result, the fine shall be not more than $10,000, or imprisonment not more than 10 years, or both.

The act authorizes the ICC to utilize the services of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles (known as the Bureau of Explosives) as well as any of the U. S. Government departments, commissions, boards, or officials.

As the ICC does not include any technical representatives and as the adoption of and changes in the regulations come under that section of the commission which is supervised by the director of Bureau of Service, who has many other duties, it was necessary to take advantage of that portion of the Act of Congress which authorized the commission to utilize the services of the Bureau of Explosives.

The director of Bureau of Service gives due consideration to recommendations that may be made by the

(Continued)

See
General American for
CREATIVE FILTER ENGINEERING

New Conkey Rotary Leaf Pressure Filter brings big advantages with "non-opening" operating cycle

Designed to do your job best!

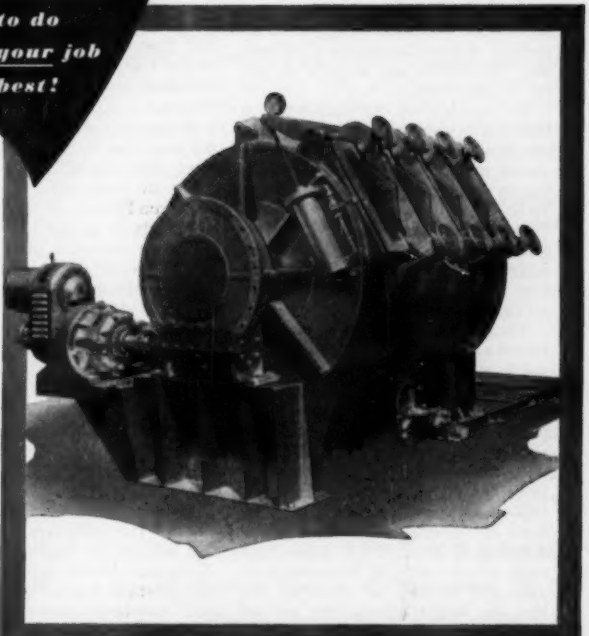
Cyclic filtration of slow filtering slurries and clarification of suspensions

What are the big advantages of the new Conkey "non-opening" cycle operation? **Maximum labor saving obtained here! Only occasional valve manipulation needed. No worker-handling of filter cloths because the filter is not opened for cake discharge. Volatile solvents can be handled with negligible evaporation losses. Less danger to personnel from corrosive liquids. The entire filter may be insulated for operation at high or low temperatures. And the extremely compact design makes for minimum cubic footage and low installation charges.**

Rotation of leaves prevents settling. This helps build a non-tapering cake of uniform thickness and porosity for positive washing, maximum drying and clean discharge.

Other outstanding features: Filter medium may be either metal or fabric. Quick filter cloth changes are easily made by sector removal through inspection doors. Dry or sluicing cake discharge is provided for with complete cake discharge and cloth cleaning result.

To make some interesting comparisons, write for Technical Bulletin No. 105.



Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Dryers, Towers, Tanks, Bins, Kilns, Pressure Vessels

OFFICES IN ALL PRINCIPAL CITIES

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Transportation Corporation
Sales Office: 10 East 49th Street, New York 17, N. Y.
General Offices: 135 S. La Salle St., Chicago 90, Ill.

Bureau of Explosives relative to changes in the existing regulations. This results from the fact that the Bureau of Explosives through its many years of experience is extremely well equipped technically both as to engineering staff and laboratory facilities to handle this work.

Many shippers have the false impression that the Bureau of Explosives is a government department, but this is not the fact. This legislation requires that the railroads must abide by the regulations and in order to meet this obligation, they organized the Bureau of Explosives. The bureau is largely supported by the railroads, although some steamship companies, express companies, and shippers contribute to its maintenance. The staff of the bureau is of the highest integrity. They deserve the commendation of the industry for the way in which they have handled their work over the many years of their existence. The bureau cooperates with industry to the fullest extent possible. They are sympathetic to the work and aims of the several technical container committees of the Manufacturing Chemists' Association and actively cooperate in their work.

The act is somewhat ambiguous in that it does not define all of the terms which are used in the law. For instance, it is stated that the act is binding on all common carriers. Although there is no definition of the term "common carrier," which it is the duty of the courts to decide in each instance, it is generally assumed that any transportation facility which is for public hire is a common carrier.

These regulations are necessarily involved as they cover detailed container specifications and shipping regulations for a vast number of materials of widely differing characteristics. Shippers and carriers may have difficulty in understanding and using the regulations because of their complex structure. The purpose of this article is to explain the construction of the regulations and thereby to aid in the understanding of them. It is hoped that some of the existing misunderstandings will thereby be corrected and that the intent behind this law will be more clear.

It is not the policy of the bureau to further complicate the shipping regulations by writing additional specifications for the transportation of new products unless it is evident that a real hazard exists. Therefore the shipper need not hesitate to discuss with them questions involving the transportation of new products.

The present regulations are contained in Bureau of Explosives Pamphlet No. 4 which was issued Jan. 6, 1941. A great many revisions and additions have been made since this book was issued. All changes have been published by the Bureau of Explosives as supplements. The ICC incorporated all of these revisions into a new printing of the regulations and the regulations pertaining to transportations by highway were added. This consolidation was printed in the December 2 issue of the *Federal Register*. The Government Printing Office will print this up-to-date consolidated edition early this year. In addition, the Bureau of Explosives is preparing a new edition of their pamphlet which it is expected will be published soon. They print the regulations as well as supplements in loose leaf form. Thus, all revisions are automatically incorporated in the regulations merely by substituting the revised sheets. This obviates the necessity of checking all supplements each time the regulations are referred to.

In order to facilitate the use of these regulations as a quick and ready reference, it is recommended that they be placed in a ring binder in the order specified and indexed as explained in the accompanying illustration.

Dangerous articles shipped by motor truck and by water are also regulated. The requirements for rail shipments are issued as the basis and only those conditions which are peculiar to shipments by public highway and by water are covered in detail in regulations governing transportation on board vessels and by motor truck.

Truck regulations cover in detail instructions pertaining to shipping papers, attendance of truck drivers and packing, lighting, loading, mufflers, fire extinguishers, and even specifications for cargo tanks.

Water shipments of hazardous articles are regulated by the Bureau of Marine Inspection and Navigation of the U.S. Coastguard. Their regulations entitled "Regulations Governing the Transportation, Storage, Stowage or use of Explosives or Other Dangerous Articles or Substances, and Combustible Liquids on Board Vessels" may be purchased from the U.S. Government Printing Office. They were issued April 9, 1941, but have been amended many times since publication. These regulations include combustible liquids which are not classed as dangerous for rail movement and which are defined as liquids flashing above 80 deg. F. and at or below 150 deg. F. by Tagliabue's open-cup tester.

Basically the regulations are divided into two main sections as follows: (1) regulations covering the preparation of articles for shipment including authorized types of containers, weight limitations, required marking and labelling, exemptions, etc.; (2) container specifications include the detailed construction requirements and prescribed tests for each type of container.

The regulations classify dangerous articles by groups and often sub groups as shown in the accompanying tabulation. Each group is defined and most of the well known compounds included in the group are listed in the commodity index. As the degree of hazard varies considerably for substances classified in each group there are special regulations prescribed for the more hazardous ones.

The ICC is authorized either upon its own motion or upon application of any interested party to make changes or modifications in the regulations which may be made desirable by new information or altered conditions. For this purpose the commission uses the services of the Bureau of Explosives as authorized by the act. The Bureau of Explosives makes inspections, conducts investigations, and confers with manufacturers and shippers in order to determine what regulations will within reasonable limits afford the highest degree of safety in transportation by rail, highway, and water. The Bureau of Explosives reports its findings and recommendations to the commission. In their deliberations, due consideration is given to the expert opinion of the bureau.

The decision of the ICC on proposals for changes is usually published as an order if the amendments are not opposed. In the event that shippers, container manufacturers, or others, oppose a change, it is the practice of the commission to defer decision until all interested parties have an opportunity to set forth their case either by letter or in an open hearing.

The act of June 25, 1948, requires that 90 day notice after publication should be given before the amendments become mandatory. The commission is authorized to establish amended regulations upon less than 90 day notice only in instances where special and peculiar circumstances or conditions fully justify it.

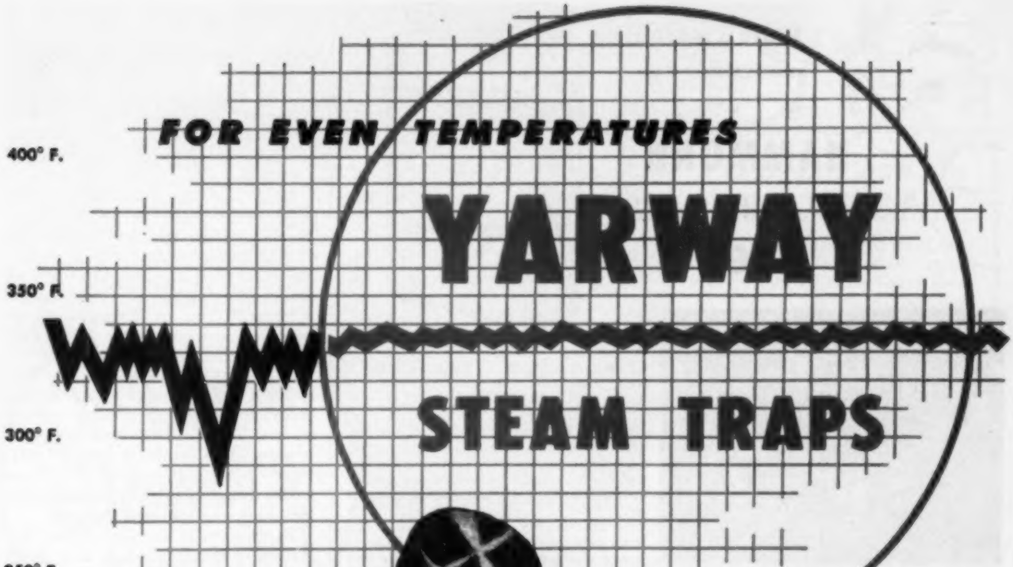
It is clearly the responsibility of the shipper to comply with the regulations in the preparation of dangerous articles for transportation by common carriers by rail freight, rail express, rail baggage, highway and water. This includes observance of requirements governing container specifications.

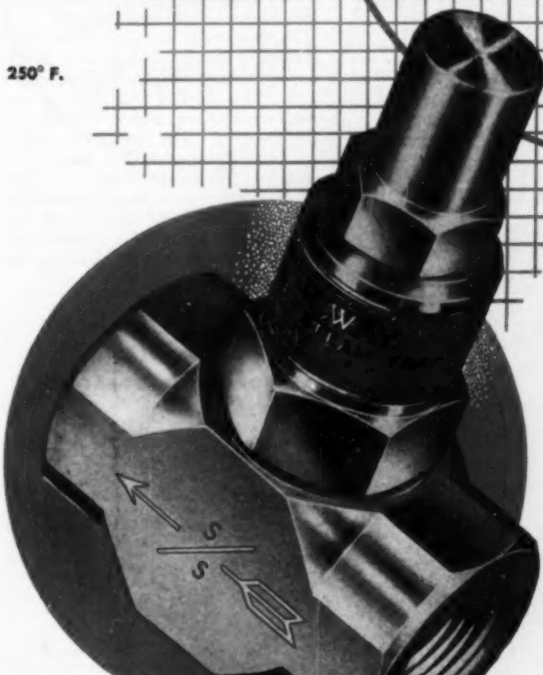
(Continued)

FOR EVEN TEMPERATURES

YARWAY

STEAM TRAPS





● Processes requiring careful temperature control call for Yarway Impulse Steam Traps on steam equipment.

The reason . . . Yarway traps maintain even temperatures because they *continually* sample and respond to a trickle of the condensate. There is no arrest in flow, no waiting for large quantities of condensate to accumulate, or trapped steam pockets to condense.

Other reasons why Yarway Impulse Traps have become first choice in many thousands of plants:

- **They get equipment hotter, sooner**
- **Small size, light weight**
- **Easy to install, easy to maintain**
- **Only one moving part**
- **Good for all pressures**
- **Stainless steel construction**
- **Low cost**

If you are not already familiar with these and other advantages of the Yarway Impulse Steam Trap, try one *for free* and find out for yourself. Call your nearby Yarway distributor, or write to:

YARNALL-WARING COMPANY

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BRANCH OFFICES IN PRINCIPAL CITIES

Stainless Steel Body

YARWAY IMPULSE STEAM TRAP

packing instructions and shipper's certificate of compliance. It is often difficult to decide whether a specific compound should be classed as dangerous. An attending tabulation shows a suggested means of resolving such questions.

Matters affecting the public safety must receive the utmost consideration. This responsibility falls on the Bureau of Explosives because the ICC depends on this agency. Members of the bureau therefore can recommend new regulations or amendments to existing regulations only after they have positive knowledge of the effects of any such changes. Positive proof of the successful record of this bureau is contained in their annual reports. The frequency of accidents in transportation involving dangerous articles has steadily declined. Their results deserve the highest commendation from the chemical industry.

In addition to its other duties, the Bureau of Explosives acts as a policing agency for the railroads and shippers. This work is handled by inspectors who are located throughout the country. The problems which confront the bureau are many and complex. An appreciation of their work together with an understanding of the objective for which they are striving must impress the shipper with the fact that this work deserves his hearty support.

Dangerous Chemicals As Defined by ICC

ACCEPTABLE EXPLOSIVES*

Class A
Sec. 73.53

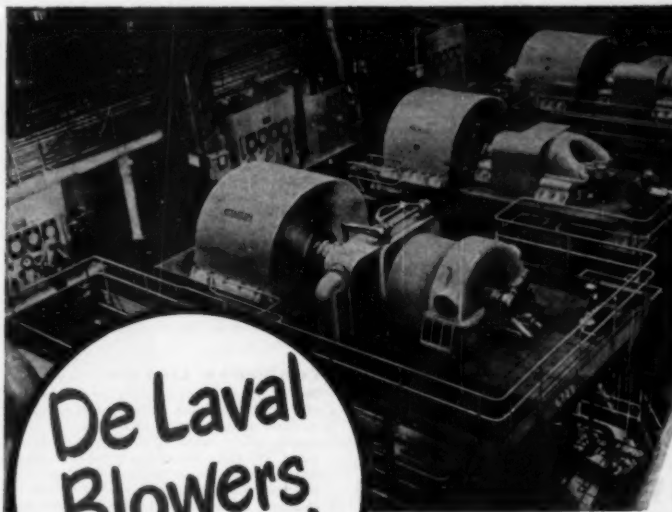
Class B
Sec. 73.88—Those explosives which in general function by rapid combustion rather than detonation and include some explosive devices such as special fireworks, flash powders, some pyrotechnic signal devices and certain forms of smokeless powder. (These explosives are further specifically described in paragraphs (b) to (f) of this section.)

Class C
Sec. 73.100—Explosives, class C, are defined as certain types of manufactured articles which contain class A, or class B explosives, or both, as components but in restricted quantities, and certain types of fireworks. These explosives are further specifically described in paragraphs (b) to (r) of this section.

FLAMMABLE LIQUIDS
Sec. 73.115—A flammable liquid for the purpose of Parts 71-78 of this chapter is any liquid which gives off flammable vapors (as determined by flash point from Tagliabue's open-cup tester, as used for test of burning oils) at or below a temperature of 80° F.

(Continued)

* Forbidden Explosives, Sec. 73.51, defined in 14 groups.

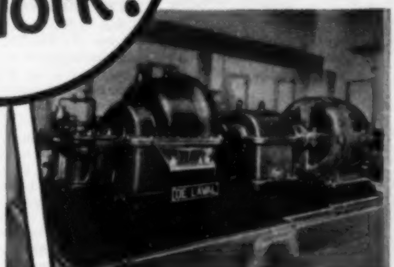


De Laval Blowers at work!

Birds-eye View of 343,000 C.F.M.

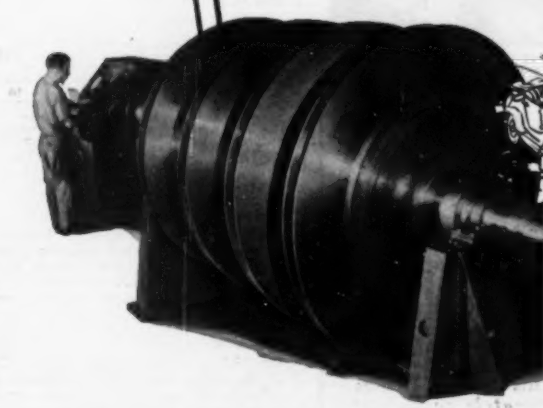
That's the combined capacity of these three big De Laval blast furnace blowers installed at the Edgar Thomson Works of Carnegie-Illinois Steel Corporation. Every day they handle enough air to fill a four foot square tunnel from Manila to Madrid and back to Miami. What's more, blast furnaces aren't shut down till they need relining and it takes husky, heavy duty machines like these to stand up for long periods of continuous operation.

For your next blower, be sure to get more than just a birdseye view of a De Laval unit. Let our engineers show you the whole picture.



They forgot the rule book for this blower!

We would never recommend that a centrifugal blower be opened for inspection only once every 22 years. Yet this De Laval two-stage machine in the Houston, Texas Sewage Disposal Plant was recently opened for the first time since it was installed in 1928 . . . *the blower and gear were in near perfect condition!* Our service man only had to clean up the journals a bit and put the unit back in service. If heavy-duty, continuous service is important, take your cue from this. We build 'em to last.



Stopping vibration before it starts!

If a cat's whisker could hang onto the edge of one of these spinning blower wheels, the unbalance it created would show up on the dials of this dynamic balancer. Any unbalance, no matter how slight, can be detected and corrected right here. This is just one of the ways we build extra years of service into a De Laval blower.

DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

50th DE LAVAL Anniversary

C-17

PACKAGING, *cont. . .*

FLAMMABLE SOLIDS

Sec. *73.150*—A flammable solid for the purpose of Parts 71-78 of this chapter is a solid substance other than one classified as an explosive, which is liable, under conditions incident to transportation, to cause fires through friction, through absorption of moisture, through spontaneous chemical changes, or as a result of retained heat from the manufacturing or processing.

OXIDIZING MATERIALS

Sec. *73.151*—An oxidizing material for the purpose of Parts 71-78 of this chapter is a substance such as a chlorate, permanganate, peroxide, or a nitrate, that yields oxygen readily to stimulate the combustoin of organic matter.

CORROSIVE LIQUIDS

Sec. *73.240*—Corrosive liquids for the purpose of Parts 71-78 of this chapter are those acids, alkaline caustic liquids and other corrosive liquids which, when in contact with living tissue, will cause severe damage of such tissue by chemical action; or in case of leakage, will materially damage or destroy other freight by chemical action; or are liable to cause fire when in contact with organic matter or with certain chemicals.

COMPRESSED GASES

Sec. 73.300—(a) A compressed gas for the purposes of Parts 71-78 of this chapter is defined as any material or mixture having in the container either an absolute pressure exceeding 40 pounds per square inch at 70° F., or an absolute pressure exceeding 104 pounds per square inch at 130° F., or both; or any liquid flammable material having a Reid (Note 1.) vapor pressure exceeding 40 pounds per square inch absolute at 100° F. (See § 73.326 for gases defined and classified as poisonous).

(b) Any compressed gas, as defined in paragraph (a) of this section shall be classified as a flammable compressed gas if either a mixture of 13 percent or less (by volume) with air forms a flammable mixture (Note 2), or the flammability range (Note 2) with air is greater than 12 percent regardless of the lower limit.

NOTE 1: American Society for Testing Materials Method of Test for Vapor Pressure of Petroleum Products (D-323).

NOTE 2: These limits shall be determined at atmospheric temperature and pressure. The method of sampling and the test procedure shall be acceptable to the Bureau of Explosives. The flammability range is defined as the difference between the minimum and maximum percentage by volume of the material in mixture with air that forms a flammable mixture.

POISONS

Class A

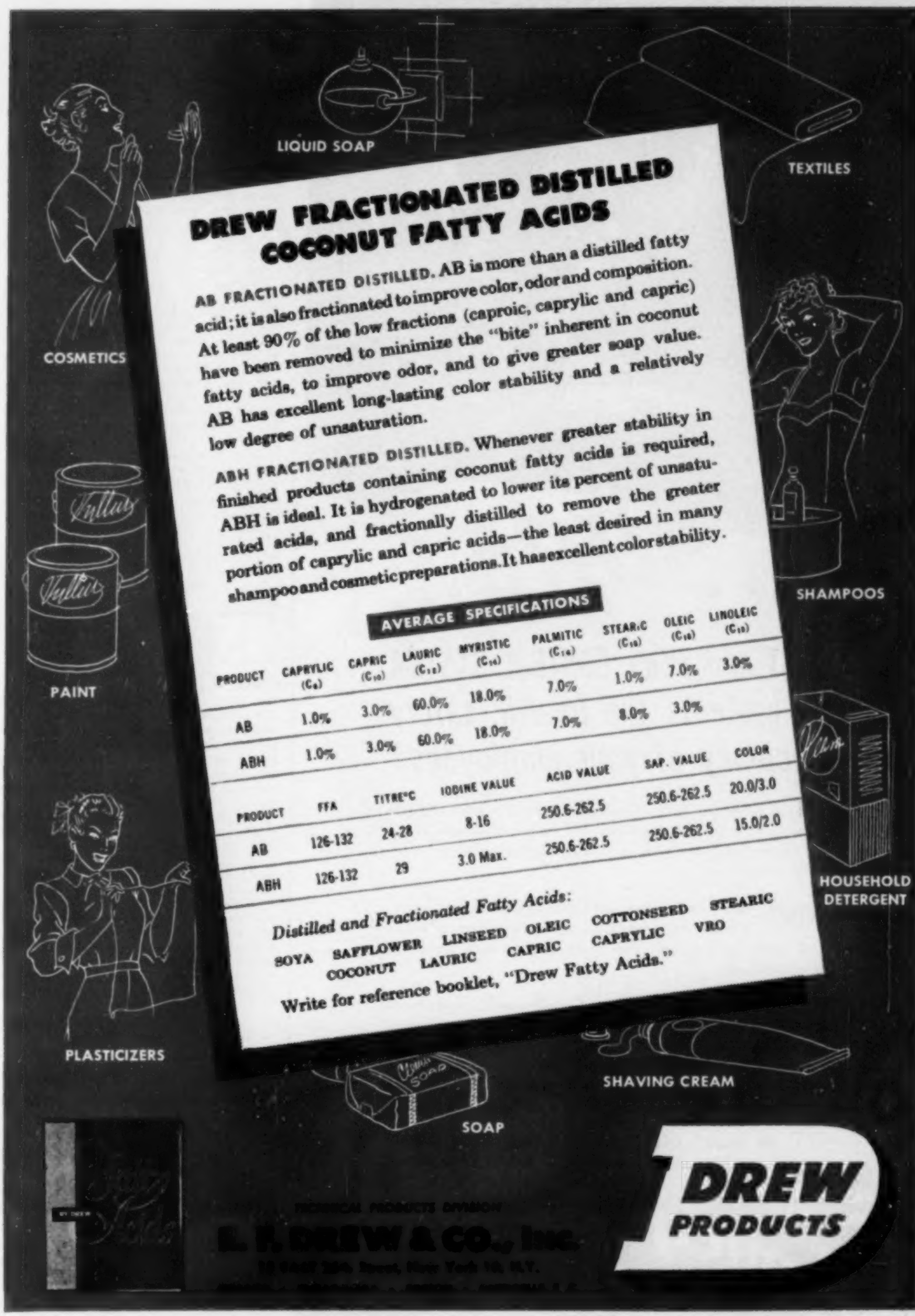
Sec. 73.326—for the purpose of Parts 71-78 of this chapter extremely dangerous poisons, class A, are poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life.

Class B

Sec. *73.343*—For the purpose of Parts 71-78 of this chapter and except as otherwise provided in this part class B poisons are substances, liquids or solids (including pastes and semi-solids), other than classes, A, C, or D poisons which are known to be so toxic to man as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man because they fall within any one of the following categories when tested on laboratory animals:

(1) Oral toxicity. Those which produce

(Continued)



DREW FRACTIONATED DISTILLED COCONUT FATTY ACIDS

AB FRACTIONATED DISTILLED. AB is more than a distilled fatty acid; it is also fractionated to improve color, odor and composition. At least 90% of the low fractions (caproic, caprylic and capric) have been removed to minimize the "bite" inherent in coconut fatty acids, to improve odor, and to give greater soap value. AB has excellent long-lasting color stability and a relatively low degree of unsaturation.

ABH FRACTIONATED DISTILLED. Whenever greater stability in finished products containing coconut fatty acids is required, ABH is ideal. It is hydrogenated to lower its percent of unsaturated acids, and fractionally distilled to remove the greater portion of caprylic and capric acids—the least desired in many shampoo and cosmetic preparations. It has excellent color stability.

AVERAGE SPECIFICATIONS

PRODUCT	CAPRYLIC (C_8)	CAPRIC (C_{10})	LAURIC (C_{12})	MYRISTIC (C_{14})	PALMITIC (C_{16})	STEARIC (C_{18})	OLEIC (C_{18})	LINOLEIC (C_{18})
AB	1.0%	3.0%	60.0%	18.0%	7.0%	1.0%	7.0%	3.0%
ABH	1.0%	3.0%	60.0%	18.0%	7.0%	8.0%	3.0%	

PRODUCT	FFA	TITRE°C	IODINE VALUE	ACID VALUE	SAP. VALUE	COLOR
AB	126-132	24-28	8-16	250.6-262.5	250.6-262.5	20.0/3.0
ABH	126-132	29	3.0 Max.	250.6-262.5	250.6-262.5	15.0/2.0

Distilled and Fractionated Fatty Acids:

SOYA SAFFLOWER LINSEED OLEIC COTTONSEED STEARIC COCONUT LAURIC CAPRIC CAPRYLIC VRO

Write for reference booklet, "Drew Fatty Acids."

PACKAGING, *cont.* . .

death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams at a single dose of 50 milligrams or less per kilogram of body weight, when administered orally.

(2) *Toxicity on inhalation.* Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams, when inhaled continuously for a period of one hour or less at a concentration of 2 milligrams or less per liter of vapor, mist, or dust, provided such concentration is likely to be encountered by man when the chemical product is used in any reasonable foreseeable manner.

(3) *Toxicity by skin absorption.* Those which produce death within 48 hours in half or more than half of a group of 10 or more rabbits tested at a dosage of 200 milligrams or less per kilogram body weight, when administered by continuous contact with the bare skin for 24 hours or less.

(b) The foregoing categories shall not apply if the physical characteristics or the physical characteristics or the probable hazards to humans as shown by experience indicate that the substances will not cause serious sickness or death. Neither the display of danger or warning labels pertaining to use nor the toxicity tests set forth above shall prejudice or prohibit the exemption of any substances from the provisions of Parts 71-78 of this chapter.

Class C

Sec. 73.381—For the purpose of Parts 71-78 of this chapter tear gases are liquid or solid substances which upon contact with fire or when exposed to air give off dangerous or intensely irritating fumes, such as brombenzylcyanide, chloracetophenone, diphenylaminechlorarsine, and diphenylchlorasine, but not including any poisonous article, class A.

Class D

Sec. 73.391—For the purpose of Parts 71-78 of this chapter, radioactive material is any material or combination of materials that spontaneously emits ionizing radiation. For the purpose of Parts 71-78 of this chapter, radioactive materials are divided into three groups according to the type of rays emitted at any time during transportation, as follows:

(1) *Group I.* Radioactive materials that emit gamma rays only or both gamma and electrically charged corpuscular rays.

(2) *Group II.* Radioactive materials that emit neutrons and either or both the types of radiation characteristic of Group I materials.

(3) *Group III.* Radioactive Materials that emit electrically charged corpuscular rays only, i. e., alpha or beta, etc., or any other that is so shielded that the gamma radiation at the surface of the package does not exceed 10 milliroentgens for 24 hours at any time during transportation.

—*End*

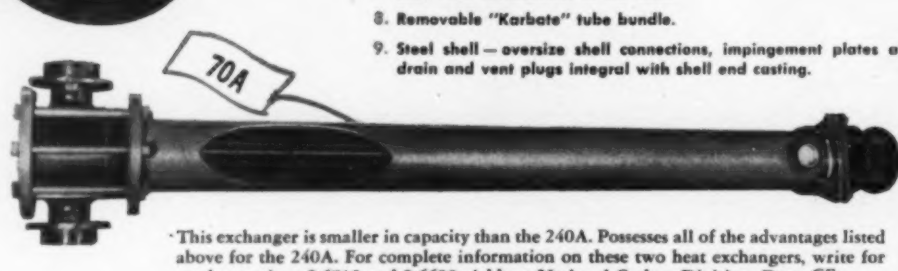
'Bye

Our continuing studies of reader interests — your interests — have convinced us that we have been putting too much emphasis on Handling, Packaging and Shipping. So this department is being discontinued this month. Watch the newly categorized Process Equipment News department for the latest dope on packaging and materials handling equipment and developments.

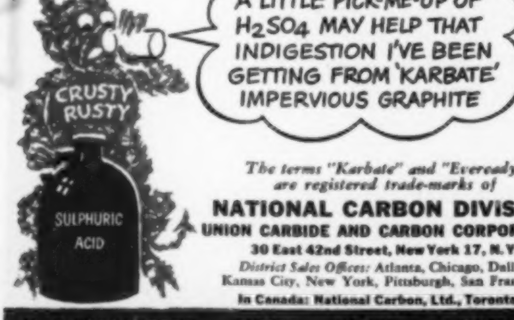
Here's the dope on 2 "KARBATE" IMPERVIOUS GRAPHITE HEAT EXCHANGERS

The new No. 240A is a shell-and-tube heat-exchanger made of "Karbate" brand impervious graphite . . . similar in construction to the familiar No. 70A . . . but with almost three times as much total effective external heat transfer surface. Advantages are:

1. 70.6 sq. ft. of external heat transfer surface.
2. Single, double or four-pass routing of tube-side fluid is effected by a simple change of fixed and floating end-cover assemblies.
3. Wide variety of corrosive fluids handled with negligible maintenance.
4. Thermal shock resistance.
5. Very high heat transfer rates.
6. Stainless steel baffles.
7. Easy tube replacement in the field.
8. Removable "Karbate" tube bundle.
9. Steel shell — oversize shell connections, impingement plates and drain and vent plugs integral with shell end casting.



This exchanger is smaller in capacity than the 240A. Possesses all of the advantages listed above for the 240A. For complete information on these two heat exchangers, write for catalog sections S-6715 and S-6690. Address National Carbon Division, Dept. CE.



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DEPARTMENT OF THE MONTH

The Corrosion Forum

(*Continued from page 147*)

Vinyl chlor-acetate copolymers are used in almost every case for the covering of plating racks. Experimental vinyl plastisol-lined plating tanks used continuously during the past three years are still giving trouble-free service. Such vinyls must be compounded with materials which will not oxidize in service.

Polyethylene and its derivatives, polystyrene, and the acrylates have been successfully used with chromic acid in the form of extrusions, moldings, and fabrications. As soon as application techniques are worked out for the lining of metal surfaces with these materials, we can look for better protection.

Iron & Steel

Albert W. Spitz, *Reiter Engineering Co., Philadelphia, Pa.*

Cast iron and carbon steel may be used in handling chromic acid solutions. However, some corrosion will occur, particularly where the metal is not homogeneous. Usually the rate is slow enough to make their use economical. If iron contamination is to be avoided, more resistant materials must be used.

Stainless

Grant L. Snair, Jr., *Allegheny Ludlum Steel Corp., Brackenridge, Pa.*

Straight chromic acid solutions of high concentration at any temperature corrode most ferrous metals, and the stainless steels are no exception. However, with other chemical compounds in solution, or with chromic acid alone in low concentrations at moderate temperatures, the austenitic (chromium-nickel) stainless steel grades are used with good results.

Stainless steel is excellent in certain textile applications, printing and lithographic processes, and in the mixing or preparation of medicines.

Mixtures of chromic acid with other acids may be critical. Because chromic acid is a strong oxidizing agent, certain combinations of acids such as a solution containing 4 percent chromic acid plus 4 percent hydrofluoric acid can be used to improve temporarily the passive surface condition of the chromium-nickel grades.* On the other hand, chromic acid with other kinds or percentages of acids might increase the corrosion rate over that of the separate acids.

Most chromium plating baths containing relatively small percentages of chromic acid and sulphuric acid are safely handled at temperatures around 70 deg. F. in Type 304 tanks. But service at higher temperatures depends upon the exact concentrations and temperatures involved, and whether metal contamination due to slight attack would be objectionable. Type 316 is preferred for such service.

The stainless steels are satisfactorily resistant to corrosion by dilute solutions to chromic acid at room temperature, but appreciable attack begins as the temperature approaches 170-180 deg. F. At boiling, Type 316 is the only grade suitable for handling solutions containing over 10 percent chromic acid.

Glass Lining

S. W. McCann, *The Pfaudler Co., Rochester, N. Y.*

Glass lined steel has excellent resistance to chromic acid solutions at all concentrations up to the boiling point. It has not been widely used in the chromium plating field due to rough handling in plating large pieces.

However, a new process for concentration and recovery of chromic acid from plating baths uses a glass lined evaporator. Most metals and alloys are rapidly attacked in such service. The process was developed primarily to recover chromic acid from discarded wash water, also to avoid stream pollution.

Rubber Lining

James P. McNamee, *U. S. Rubber Co., Providence, R. I.*

Chromic acid has a very destructive effect on natural rubber and most synthetic rubber compositions. Special newly-developed butyl linings are available, however, which appear to be satisfactory for chromic acid concentrations as high as 30 percent at temperatures of 120 to 140 deg. F.

This is the usual concentration and temperature range used for chrome plating work, and steel equipment lined with butyl compositions of this type should be seriously considered.

Tantalum

Leonard R. Scribner, *Fansteel Metallurgical Corp., N. Chicago, Ill.*

Tantalum is completely inert at all concentrations and temperatures. Tantalum heaters are used for sulphuric-chromic acid metal cleaning baths. There should be applications in chromium plating operations where acid is hot and concentrated.

Nickel & Alloys

W. Z. Friend, *International Nickel Co., New York, N. Y.*

Nickel, Monel and Inconel are usefully resistant to dilute chromic acid solutions at atmospheric temperature but may be considerably attacked at higher temperatures. In addition nickel and Monel may, under some conditions, be subject to intergranular attack by hot solutions resulting in embrittlement. Most of the applications of these materials are for fixtures and racks handling work through chromic acid plating and cleaning solutions.

Carbon

W. M. Gaylord, *National Carbon Div., Union Carbide and Carbon Corp., Cleveland, Ohio*

Carbon and graphite are not recommended for acid solutions of chromium trioxide or chromic acid.

Neutral solutions of chromium trioxide in concentrations up to 10 percent and temperatures up to 200 deg. F. can be handled in equipment made of impervious graphite.

Lead

Kempton H. Roll, *Lead Industries Assn., New York, N. Y.*

Chromic acid is one of the major industrial chemicals with which lead is regularly used and preferred. Lead chromate which forms on contact with the acid has extremely low solubility and high adhesion.

In chromium plating, the largest chromic acid consuming industry, concentrations up to about 40 percent

(Continued)

* G. C. Kiefer, "The Passivation and Coloring of Stainless Steel," Surface Treatment of Metals, American Society for Metals, Cleveland, (1941).

chromic acid are met at temperatures ranging up to 140 deg. F. Tellurium-antimony-lead anodes or antimony-lead anodes both containing up to 6 percent antimony are used successfully. Tin-lead anodes containing 7 percent tin are also used.

Tank linings and heating coils are made of antimonial lead. Chemical lead is not generally used here.

For prolonging the life of lead equipment to be used in contact with chromic acid, anodizing is recommended. Anodizing is simply an electrolytic method of forming an adequate protective coating by making the linings and coils periodically anodic.

A new high lead alloy has recently been placed on the market which was developed expressly for use with chromic acid. Longer service life without anodizing treatment is the chief advantage of the new alloy.

Chemical Stoneware

F. E. HERSTEIN, *General Ceramics and Steatite Corp., Keasbey, N. J.*

Chemical stoneware is completely inert at the usual temperatures and pressures. It is used for pipes, pumps and vessels where purity and non-contamination are required. However, its use is limited to those applications where there are other materials present, such as hydrochloric or other acids, which would attack metallic materials of construction.

Chemical stoneware, although completely resistant, is used mainly where more economical materials of construction such as the metallics are not suitable.

Durimet 20

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

The resistance of Durimet 20 to chromic acid solutions varies and its limit of applicability is not accurately known to date. However, this alloy is used in the chemical and electroplating industries for handling this acid by itself or in combination with other corrosives.

Recent corrosion tests on chromic acid concentrations approximating those encountered in typical chrome plating baths showed that Durimet 20 is attacked considerably at the normal boiling temperatures. However, Durimet 20 has been used for certain auxiliary electroplating equipment where the temperature encountered does not exceed the normal bath temperature

(*Continued*)

and the concentration does not exceed 300 gpl. CrO_3. A solution containing 200 gpl. CrO_3 and 2 gpl. SO_4 at 120 deg. F. shows a corrosion rate below 10 mils per year.

Duriron is usually chosen over Durimet 20 for handling chrome plating solutions unless (1) increased mechanical properties are needed or (2) fluorides are present. Duriron is preferred because of its combined high corrosion resistance and resistance to increased corrosion due to stray electric currents. Stray currents make Durimet 20 unsuitable under conditions where it would otherwise be applicable. It should be well insulated when used in electroplating installations, and a temperature limit of about 150 deg. F. should be set.

Chlorimets

Walter A. Luce, *The Duriron Co., Dayton, Ohio*

Because of the oxidizing characteristics of Chromic acid, Chlorimet 2 is not recommended. However, Chlorimet 3 (nickel base alloy containing 18 percent each of molybdenum and chromium) shows excellent resistance to this corrosive. It is not widely used, though, partly because of the good resistance and lower initial cost of Duriron, and partly because it is produced only as castings.

Aluminum

A. B. McKee and A. Fitz, *Aluminum Co. of America, New Kensington, Pa.*

The performance of aluminum in laboratory tests indicates that, in the concentrations investigated, chemically pure chromic acid solutions do not have appreciable action on aluminum.

In a 30 day test at room temperature the calculated volume of metal loss was only 0.00009 cu.in./sq.in./yr. At higher temperatures the action on aluminum does not appear to be significantly greater than at room temperature.

Hot aqueous solutions containing 5 percent phosphoric acid and 2 percent chromium trioxide are widely used as a chemical cleaner for aluminum alloys. Even at elevated temperatures the action of this cleaning solution on aluminum is negligible.

Wood

Henry B. Smith III, *Michigan Pipe Co., Bay City, Mich.*

We do not feel that wood has any application for chromic acid.

Cements

RAYMOND B. SEYMOUR, *Atlas Mineral Product Co., Mertztown, Pa.*

Chromate ions act as anodic inhibitors with iron in neutral or alkaline solutions, but possibly because of the solubility of the products of corrosion, little inhibition is noted on the acid side. For example, a standard plating solution containing 275 gpl. chromic acid and 9 gpl. sulphuric acid corroded steel at the rate of 0.008 ipy. at 120 deg. F. Tanks to hold chromic acid are usually protected first with a membrane based on polyvinyl chloride or polyethylene and this membrane is then protected by carbon or dense shale brick joined with a silicate cement. In some cases, the membrane is omitted and a heavy bedjoint of silicate cement is used in its place.

No other well known commercial cement is as satisfactory for chromic acid service as sodium silicate. But those based on hydrocarbons or sulphur show good resistance with low concentrations of chromic acid at room temperature. Carbon-filled phenolics are also suitable for weak concentrations at low temperatures and all three materials are usually satisfactory for joining brick or tile in floors in plating rooms.

The improved type furfuryl alcohol cements are more resistant than the older type to dilute solutions of chromic acid at room temperature but furfuryl alcohol cements should not be considered even in floors for chromic acid service. Cements based on portland cement or admixtures, asphalt, Thiokol, or melamine resins are completely unsatisfactory for chromic acid service.

The usefulness at room temperature of various cements is compared in the following table:

Cement	Chromic Acid, Percent* 5	10	15	20
Silicate	E	E	E	E
Sulphur	V G	G	F	E
Carbon filled phenolics	G	F	F	P
Polyfurfuryl alcohol	F	P	P	P
Portland	V P	V P	V P	V P

* Legend: E—Excellent, F—Fair, G—Good, P—Poor, V G—Very Good, V P—Very Poor.

Silicones

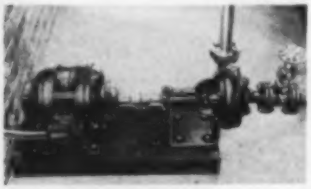
J. A. McHARD AND LEON VAN VOLKINBURG, *Dow Corning Corp., Midland, Mich.*

Laboratory test data shows that the silicone elastomers which are especially designed for chemical resistance are not appreciably affected by either 10 or 50 percent chromic acid at room temperature.

Data on the resistance of the silicone resins are incomplete. Only one

(Continued)

formulation, which is used as a bonding agent for silicon-glass laminates, has been tested in contact with chromic acid. Results are good.



Worthite pump handling tan solution.

Worthite

W. E. Pratt, *Worthington Pump and Machinery Corp., Harrison, N. J.*

Worthite pumps have been used very successfully in handling chromic acid for anodizing aluminum.

Chrome plating solutions are also handled satisfactorily by Worthite pumps. One failure was due to faulty insulating against stray electric current. Where insulated flanges (plastic tube around bolts and plastic washers under bolt heads) are used, the pumps should be located away from the plating tank and the flanges protected from any dripping acid that could short the insulation. Avoid any metallic connections that could possibly carry stray current to the pump, and check the completeness of the insulation with a meter.

American Leather Chemists Association tests show the corrosion rate of a Worthite sheepskin tanning drum, upper leather paddle, and chrome sole vat (one bath chrome tanning) to be 0.0002, 0.0001, and 0.0003 ipy, respectively.

The manufacture of chrome tan solution probably imposes the most corrosive conditions in the leather industry. International Nickel Co. spool tests under varying conditions show the corrosion rate of Worthite to range from 0.0001 to 0.005 ipy.

M of C Corrections

Here are additions and changes you should make to your November 1950 report on Materials of Construction to bring it up to date:

Directory of Manufacturers, Additions: Under Carbon and Graphite, add Great Lakes Carbon Corp. (Electrode Div.), Niagara Falls, N. Y., and the United States Graphite Co., Saginaw, Mich. Great Lakes Carbon makes graphite anodes and graphite shapes for special chemical reactors and linings—also carbon brick for tank linings and flooring. They all resist attack by strong acids, strong bases, chlorine, and liquid metals (except carbide formers). Under Metals & Alloys, add the Indium Corp. of America, New York, N. Y. as a manufacturer ofindium and indium products, and the Wall Colmonoy Corp., Detroit, Mich., as the manufacturer of Colmonoy Ni-Cr-B alloys. These hard-facing alloys are applicable primarily for pump and valve parts in sulphuric and hydrofluoric acid, sodium and potassium hydroxide, brine, and sulphurous acid services.

Directory of Manufacturers, Changes: Under Carbon and Graphite, see Impervite. Falls Industries, Inc., Solon, Ohio, should be listed as the manufacturer of this product, and chromic acid struck out from the list of applications. Under Plastics, the polyvinyl acetate emulsion manufactured by Dewey and Almy Chemical Co., Cambridge, Mass., should be designated as Darex Polymer X56L.

Tantalum vs. phosphoric acid: On p. 132, where SO_3 appears, it should read SO_4. (Article by F. L. Hunter, Fansteel Metallurgical Corp., N. Chicago, Ill.)

—End

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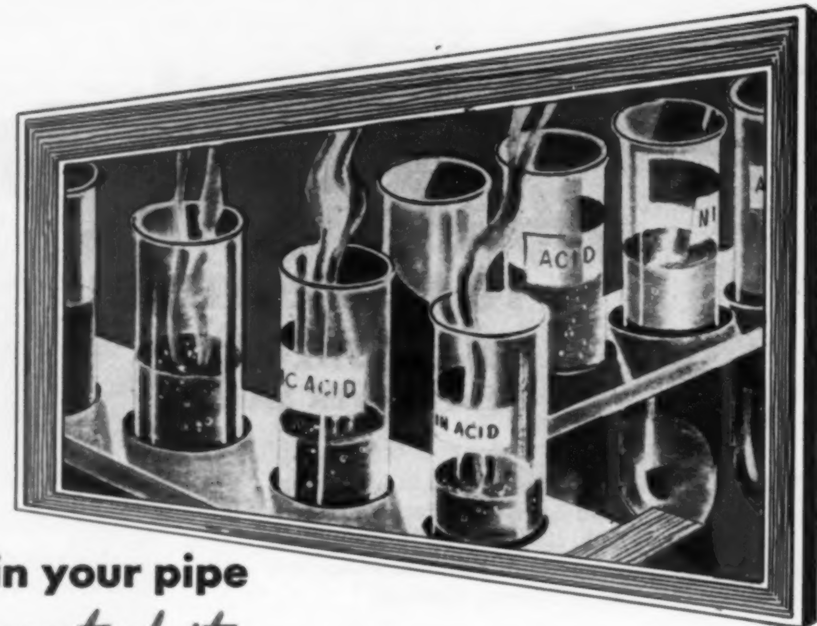

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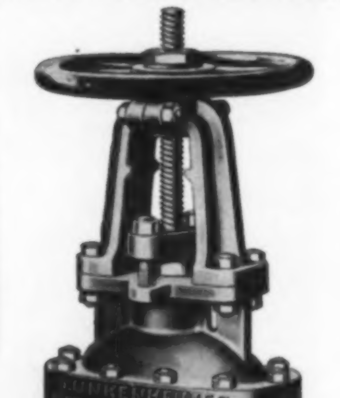

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"Causul" Metal is an austenitic iron, containing about twenty percent nickel and substantial percentages of copper, chromium, and molybdenum. The proportioning of the alloy and manufacturing methods insure a full solid-solution matrix — the copper never occurring "free." Carbon, sulphur, and phosphorus are held at low limits. Special processing, in electric furnaces, adds to corrosion resistance, soundness, and toughness.

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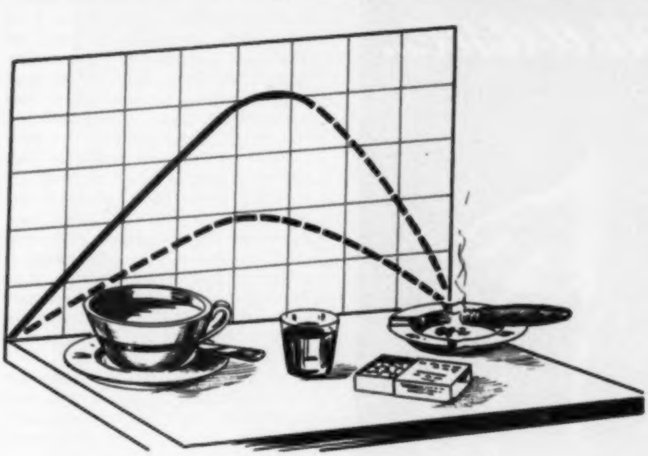

Stimulants—Lift or Letdown?

The battle against fatigue grows more intense. But how much can stimulants help?

To the abject horror of moralists and temperance groups it must be admitted that man has an age old urge to use stimulants to offset fatigue or stress. Whether he's a South American indian munching coca leaves, a plant worker sipping black coffee or a big executive having a "short one" after a busy day, the seeking of the "lift" is common to all. But the big question is how much "lift" is there to be gained from stimulants and what, if any, are their effects on the mental and physical processes of the body?

With a stepped up production era once again facing us there is little doubt that this question will be asked time and time again by plant managers, industrial relations experts and any worker in plant or office who uses stimulants to offset the effects of disrupted sleeping and living habits.

In seeking at least a partial answer to this poser the "Human Equation" flipped through the pages of a voluminous tome called "Handbook of Human Engineering Data for Design Engineers." It was compiled by the Tufts College Institute for Applied Experimental Psychology at the behest of the Special Devices Center of the Office of Naval Research as a guide toward integrating equipment design with human performance limitations.

Toward the back of the work appeared a section on "drugs" which was defined as "a neat catch-all term for chemical substances which when introduced into the body change our normal physiological and psychological processes; this process may be beneficial or harmful depending upon specific characteristics of the drug, the conditions of its use, and the person using it."

"Drugs" discussed in the chapter were caffeine, tobacco, alcohol and benzedrine. The subject matter consisted of a roundup of data from tests run by several investigators on the influence of these substances on the motor and mental processes of the human animal.

Few pathological observations were made, i.e. alcoholism, tobacco poisoning and the ethical considerations involved in the use of the drugs were said "to require decisions which only the individual reader can make."

CAFFEINE VS. FATIGUE

The studies reported that caffeine, found in coffee, tea and cola drinks, generally affords stimulation and usually without the secondary letdown that is experienced with other drugs. Also encouraging to coffee drinkers was the statement that there is no evidence of harmful effects from the continued use of moderate amounts of caffeine by normal adults.

Peculiarly, the stimulating influences of caffeine are not observed when an individual is interested and rested. But they show in their greatest effect when used against boredom and fatigue. Perhaps this explains why the effects of caffeine are markedly greater when it is taken toward the end of the day than in the forenoon.

The old argument about caffeine vs. sleep was also taken into consideration by the report. It declared, however, that in small doses of 1 to 4 grains (two cups of coffee) caffeine does not produce sleep disturbance except in a few individuals. On the other hand, doses of 5 to 6 grains or over caused impairment in both quantity and quality of sleep with most people tested. And the amount of this impairment does not depend on age, sex, or previous caffeine habits but it does vary inversely with body weight.

Caffeine generally stimulates motor processes and improves the rate of movement and resistance to fatigue. But this seems to be accomplished at the expense of efficiency of coordination of movements. In a simple typewriting test the speed of the typist was increased by a dose of 1-3 grains of caffeine but retarded by a dose of 4-6 grains. But (executives please note) errors were less for all doses.

Caffeine also seems to be a generally helpful stimulant for mental processes. But here the effect is greater for small rather than large doses and it usually doesn't appear for some hours after ingestion.

But whether or not caffeine does step up motor and mental processes it apparently does have the effect of making people feel they can do a better job . . . . and in a way, especially from the standpoint of human relations, that's half the battle.

TOBACCO—A PROBLEM

Tobacco presents a real problem to the experts. Medical men, psychologists and even smokers themselves are at a loss to explain the strength of the smoking urge in many individuals. One expert offers the explanation that much of the pleasure is derived from seeing and handling a cigarette or pipe. In a unique test run on this aspect of smoking, half the subjects

(Continued)

were unable to distinguish between when they were smoking tobacco and when they were smoking warm air.

In the majority of cases however, smoking produces a short period of stimulation followed by a period of depression according to some investigators. But again, as is true of most mild stimulants, the question of how much of the effect is suggested and how much is real continues to arise.

Evidence indicates generally that the immediate affect of smoking is a lowering of accuracy of finely co-ordinated reactions. Individual variations are large, however, depending considerably on the wide range of tolerances that different persons have for tobacco. In most cases smokers who have developed a tolerance for tobacco show little or no decrease in coordination after smoking.

In fact, there is some indication that in mental process reactions, such as addition and oral reading speed, smoking steps up the performance rating of the habitual smoker.

ALCOHOL—DOSAGE DECIDES

The general consensus among most of the experts is that alcohol is a depressant or narcotic, which first affects the controlling or inhibiting functions of the nervous system. Intoxication, however, has many definitions which differ considerably and depend on whether a legal, medical or psychological mouth speaks them.

But the average doses of alcohol administered in psychological experiments are large enough to produce a blood concentration of alcohol at which only 10 percent of the individuals tested would be clinically classified as intoxicated.

One big difficulty in studies on alcohol is that the same doseage may produce widely variant effects depending on the manner in which the alcohol is taken. Putting it another way, the absolute amount of alcohol in a beverage is only one of the factors that decide the degree of intoxication it will induce. The presence of sugar in a beverage often raises the intoxication threshold. Wine, for example, is approximately 20 percent less intoxicating than distilled liquor having an equal alcoholic content.

Several investigators on the subject claim that small doses (10-20 cc.) of alcohol have been found generally to increase the output of untired muscles for at least a short time. Medium doses (30-45 cc.) make the increase less pronounced, while large amounts such as 60 to 80 cc. usually produce no change in output or a decrease.

But while the output of energy may

(Continued)


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be increased, muscular coordination often takes a nosedive. And the greater the complexity of the task, the greater the degree of impairment due to alcohol in its performance.

Although, even in tasks of high complexity, impairment might be offset by familiarity with the work, there is some relationship between the blood alcohol concentration and the amount of impairment.

When mental processes are considered, alcohol must also be termed an impairing factor. Memory and learning processes both suffer according to the size of the dose and thought associations seem to slack off with the result that the speech of the subject becomes stereotyped.

BENZEDRINE—A RISKY BUSINESS

Benzedrine is a comparative newcomer to the stimulant field. But it received considerable attention during the last war as a means of offsetting fatigue in military and industrial personnel who had to remain awake over long periods of time.

Because of the unpredictable and undesirable reactions benzedrine may produce in some persons, medical authorities are insistent that it be used discriminately and not for extended periods. For this reason benzedrine is controlled in most states on a medical prescription basis.

Unlike caffeine, benzedrine stimulates regardless of whether the subject is fatigued or rested. But like caffeine, suggestion seems to play a big role. The performance of subjects given "dummy" pills, which they thought contained benzedrine, stepped up considerably. This applied even to fatigued subjects who claimed to feel an increased feeling of well being and an ability to perform work.

Motor processes, as measured by tests of marksmanship, muscular capacity and hand-eye coordination in operating a model airplane, were significantly improved by the use of benzedrine.

Mental processes, on the other hand, did not fare so well. In most cases benzedrine brought only a slight increase in performance rating, if any.

Perhaps after all, the "big lift" from stimulants in moderate doses comes from the subject's feeling that he has taken an active step to help himself over a particularly high hurdle. The mere ceremony in doing this may provide the rallying point for renewed efforts. If so, coffee pots and briar pipes will continue to be the totem poles of a working America for some time to come. —End

Names in the News Edited by Frances Arne

Thomas F. Edson. Executive assistant in Chicago headquarters of Victor Chemical Works. To supervise construction of elemental phosphorus electric furnace plant at Silver Bow, Mont. Formerly executive vice president of A. R. Maas Chemical Co., Victor division. Graduate of California Institute of Technology .

John C. Hostetter. Recipient of the Albert Victor Bleininger Award of 1950 presented by the American Ceramic Society for achievement in the field of ceramics. Retired president of Mississippi Glass Co. Previously associated with: National Bureau of Standards; geophysical laboratory of Carnegie Institution of Washington; Corning Glass Works as director of research and development; Hartford-Empire Co. as vice president and director of research. Graduate of Bucknell.

J. C. Hostetter

J. L. Franklin

J. L. Franklin. Head of the department of chemical engineering at the University of Minnesota; has been research associate in the refining technical and research division of Humble Oil and Refining Co. Joined Humble in 1934. Major fields of interest: electric discharge; solvent extraction and refining of lubricants; thermodynamics; chemical kinetics; mechanism of organic reactions. Graduate of the University of Texas, B. S. and M. S. in chemical engineering, Ph.D in physical chemistry.

Walter W. Braun. From head of Natoinal Lead's analytical department in Brooklyn to senior chemist, titanium alloy manufacturing division, Niagara Falls.

J. A. Furer. Vice president and chairman of research and development, Armed Forces Chemical Association. Rear Admiral, USN Ret. Commissioned in 1903; served at navy yards at New York, Charleston, Philadelphia and Pearl Harbor. Studied at Naval Academy and MIT.

John E. McKeen. Chairman of the board of Chas. Pfizer & Co. Continues as company president, a post held since 1949. Joined Pfizer in 1926. Graduate of Brooklyn Polytechnic Insitute. Newly elected director of Manufacturing Chemists Association.

John L. Galt. Manufacturing engineer of GE chemical department's chemicals division phenolic products plant. Process development engineer for GE since 1947. Graduate of the University of Texas.

Robert L. Gibson. General manager of GE's chemical department with headquarters in Pittsfield, Mass.; formerly assistant general manager. With the company since 1925. Graduate of Park College, Mo.

J. G. MacDermot. Assistant director of Monsanto Chemical Co.'s foreign department; has been manager of western operations and vice president of Monsanto (Canada) Ltd. Graduate of the University of British Columbia.

James E. Tipton. Research junior chemist, technical department, A. E. Staley Mfg. Co. Graduate, 1950, James Millikin University.

Karl T. Compton. Winner of the first award of the $1,000 William Proctor Prize for Scientific Achievement. Scientific Research Society of America administers prize. Chairman of the corporation of MIT; president from 1930 to 1948. Formerly headed: National Defense Reseach Committee, Office of Scientific Research and Development, Research Board for National Security, President's Advisory Committee for Universal Military Training.

Raymond C. Gaugler. Newly-elected president of American Cyanamid Co.; has been executive vice president. Joined company in 1917; director since 1929. Graduate of Duquesne University.

D. B. Keyes. Resigned vice president of Heyden Chemical Corp., New York. Continues as director; to serve as special consultant.

Wilbur B. Pings. Director of research for Witco Chemical Co. with headquarters in Chicago. Previously: chemist at Du Pont's experimental station in Wilmington; research executive for Arthur D. Little and Godfrey L. Cabot. Graduate of University of Illinois; doctorate in organic chemistry, University of Minnesota.

W. B. Pings

R. K. Gottshall

Ralph K. Gottshall. Assistant to the president, Atlas Powder Co., Wilmington; has been assistant general manager of the explosives department. Previous Atlas positions: began as chemist in 1927 at the Joplin, Mo., plant; chemist, Giant, Calif., plant; member of the explosives sales department; manager of the northwestern district sales office; director of sales for the explosives department. Graduate of Lafayette.

Charles E. Loucks. Commander, Army Chemical Center, Edgewood, Md. Brigadier General. During World War II, commanding general of the Chemical Warfare Service's Rocky Mountain Arsenal at Denver. Studied at Stanford and MIT.

Philip L. Southwick. Recipient of a Frederick Gardener Cottrell grant by the Research Corp. to continue a research project in synthetic organic chemistry. Associate professor of chemistry at Carnegie Tech. Studied at Universities of Nebraska and Illinois.

Lester Crown. Vice president and chemical engineer of Marblehead Lime Co. Graduate of Northwestern University and Harvard Graduate School of Business Administration.

C. J. Stoltenberg. Assistant to the general personnel director, Victor

(Continued)

Chemical Works. Chemical engineering graduate of Iowa State College. With Victor since 1945 as: chemical engineer, assistant in the production department, division superintendent at the Chicago Heights plant.

Eugene E. Woolley. To have charge of manufacturing at all General Mills plants in its chemical division. Continues as vice president of the chemical division. With company since 1941; plant manager of Belmond, Iowa, soybean processing plant and refineries since 1948.

Craig C. Walden. Staff member of British Columbia Research Council. To investigate application of organic chemistry to utilization of waste products from the lumber, agriculture and fisheries industries in the province. During the war, control and development chemist at Defense Industries Ltd., Montreal. Most recently, in charge of plant laboratory, Quaker Oats Co., Saskatoon. Studied at Universities of Saskatchewan and Minnesota.

Robert D. Woosley. Instructor in chemistry, Ordark Division, University of Arkansas Institute of Science and Technology. Formerly employed at Army Chemical Center, Md. Graduate of Hendrix College. New research assistant: **Keith A. Catto.** Graduate of the University of Arkansas.

Milton C. Whitaker. Charles Frederick Chandler Medalist and Lecturer for 1950; chosen by Columbia University for outstanding achievements in organization and management of scientific research in the development of chemical industries. Consulting chemical engineer, American Cyanamid Co. Graduate of the University of Colorado. Winner of the 1923 Perkin Medal. Some former positions: professor of chemical engineering, Columbia; vice president, U. S. Industrial Alcohol Co.; president, U. S. Industrial Chemicals; vice president, American Cyanamid Co.

Charles W. Beckett. Member of the thermodynamics section of the National Bureau of Standards. To prepare tables of thermal properties of gases. Formerly associate supervisor of the literature survey group at Ohio State also dealing with thermodynamics. Studied at the University of California.

The versatile gentleman alighting from the jet plane is our . . .

MAN OF THE MONTH: *Bruce K. Brown*

. . . chemical engineer, patent lawyer, businessman and government administrator.

The energy that brought him success in four distinct careers in 52 years had to be something like jet propulsion. Aviation, as a matter of fact, is one more field in which he has had a hand. With the Petroleum Administration for World War II he worked on the program which gave the U. S. tremendous output of vitally needed fuel for air war. He has just resigned the presidency of Pan-Am Southern Corp. to begin a second tour of duty for the government. He takes on the Number 1 position in the Petroleum Administration for Defense.

Mr. Brown started planning career-wise earlier than most. At ten he was using his allowance to furnish a chemistry laboratory in the basement of his Wilmette, Ill., home. At twenty-two he had a year's Army experience, a master's in organic chemistry from the University of Illinois, a wife and a job as chief chemist in Burgess Labs in Madison, Wis.

Some visitors were being shown through the laboratory while he was working at his bench. One stopped to ask what he was doing. Being a friendly and trusting soul, he told him—even spelled out the chemical reactions. The fellow turned out to be a commercial spy who proceeded to patent the process and sell it to a competitor. Because he was ashamed of being so gullible, Mr. Brown decided to study up on patents in order to help his employer win his suit against his competitor.

Next he got a job in the patent department of Commercial Solvents at Terre Haute, Ind., and in a few years he was admitted to the Indiana Bar. Soon he was practicing patent law in New York, and one evening he was having dinner at the Round Table in the Chemists Club. He got into a heated argument with a visitor, an assistant director of research for Standard Oil of Indiana. He lost the argument but made a friend. Bob Wilson offered Bruce Brown a job in the research department at Whiting. In two years he was general manager of that department.

After his four year stint with the Petroleum Administration during the war, he returned as a vice president and director of the Indiana company. He moved to New Orleans in 1949 to undertake executive management of Pan-Am Southern, Standard subsidiary.

Now he and Mrs. Brown have taken up temporary quarters in a Washington hotel. They are maintaining their New Orleans home, though both their children (Bruce Jr. and Janet) are married so for now its only occupant is the family dog. Deep sea fishing in the Gulf was beginning to intrigue Mr. Brown; he admits, however, that the "company, conversation, singing and card playing" are more fun for him than the fishing itself.

Bruce K. Brown leads this jam-packed life with a minimum of noticeable effort. Friends say he makes it look easy.

F. R. Naish. Chemical engineer at Carbide & Carbon Chemicals Division's Louisville, Ky., plant. Formerly stationed at the company's Texas City plant.

P. L. Love. From manager of Shell Oil Co.'s manufacturing-research department in New York to manager of the Houston refinery. Studied at Mississippi College and the University of Virginia. Previous Shell positions: chemist at the

(Continued)

Wood River, Ill., refinery; chief chemist at Houston and then research director; research director at Wood River.

E. A. Smith. Manager of manufacturing, Canadian Oil Cos., Ltd. General superintendent at the company's Petrolia, Ont., refinery since 1936. Joined the company in 1919 as chief chemist.

James R. Withrow. Winner of an award presented by the central Ohio section of AIChE for pioneering chemical engineering education in the state. Emeritus professor and former head of Ohio State's chemical engineering department. Joined Ohio State faculty in 1906.

D. S. Frederick, Director of Manufacturing Chemists Association. Vice president, Rohm & Haas. Former president, Plastic Materials Manufacturers Association.

Ralph E. Olson. President of the Chicago Drug and Chemical Association. Chicago district manager of S. B. Penick Co. Vice president: **Stanley M. Lind.**

Rhodes Dayton. Member of the organic chemical development department of Lilly Research Laboratories, Indianapolis. Graduate of UCLA and University of Southern California (Ph.D. in organic chemistry).

R. W. Bates. Chairman of the referee examining board of the American Oil Chemists' Society. Associated with Armour and Co., Chicago.

Jerome Alexander. Honorary member, the American Institute of Chemists. Consulting chemists known for his work in colloid chemistry. Treasurer and chief chemist of several associated manufacturing companies making glues, gelatines, starch products.

Nelson T. Williams. Assistant professor of chemistry, Marshall College, Huntington, W. Va. Formerly with Du Pont's synthetic fibers division in Waynesboro, Va.

Lewis Hess. Head of the literature abstracting and searching section of the information division at the Ethyl Corp. research laboratories in Detroit. Joined Ethyl in 1937 as a research chemist. Graduate of MIT.

Robert F. Mehl. Chairman of the

(Continued)

What NEW STANOIL'S *longer life means to you* . . . . .

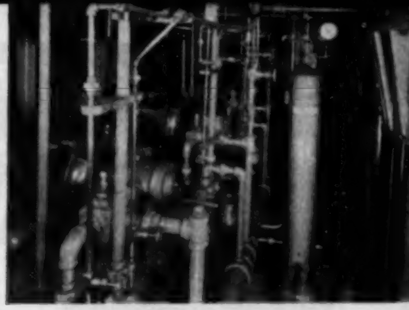
For fourteen years STANOIL Industrial Oils have proved their ability to handle a wide variety of jobs in midwest plants. Now, these established products have been made better than ever! They offer new and important savings in an even wider variety of equipment because:

1. **Greater oxidation stability** in the New STANOILS enables them to stand up under high temperatures of operation, maintain low acidity for long periods of time, and reduce to the minimum deposits caused by oil oxidation.

2. **High Viscosity Index and Low Pour Point** enable STANOILS to perform satisfactorily through a wide range of temperatures. They flow readily at low temperatures and do not thin out excessively at high temperatures.

3. **Greater protection against rust** has been provided by the addition of a corrosion inhibitor of an advanced type to all grades of New STANOIL. This inhibitor prevents corrosion trouble by "plating out" on surfaces that tend to rust. New STANOILS have practically put an end to rust and corrosion troubles.

At the right are shown several types of equipment in which the New STANOILS can save you money and maintenance time. A Standard Oil Lubrication specialist will help you find still other applications where versatile STANOILS can replace many special-purpose oils. You can reach this man quickly and easily through your local Standard Oil Company (Indiana) office. Contact him today. Or, if you wish, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.



In Hydraulic Systems. Because of the high viscosity index and low pour point of the New STANOILS, they provide smooth operation in hydraulic systems regardless of widely varying temperatures. They also eliminate foaming, which is frequently troublesome in hydraulic operation. Their high oxidation stability eliminates deposits that could cause valve sticking and wear.

In Compressors. Because of the oxidation stability and low carbon-forming characteristics of STANOILS, carbon deposits on valves are reduced in air-compressor operation. The New STANOILS separate readily from water—no troublesome emulsions in compressor crankcases.

In Reduction Gears. Because of STANOIL's resistance to acidity and to deposit formation, gear cases of reduction gears remain clean. The oil may be used for longer periods with no danger of excessive wear of gears and bearings.

STANDARD

STANDARD OIL COMPANY (INDIANA)

NAMES IN THE NEWS, cont. . .

Metallurgical Advisory Board, National Research Council. On leave from his post as director of the metals research laboratory and head of the department of metallurgical engineering at Carnegie Tech. With Carnegie faculty since 1932. Prior positions: head of chemistry department at Juniata College; National Research Fellow at Harvard.

Charles D. Thurmond. Development director, western division, Monsanto Chemical Co.; has been assistant director. One-time technical service representative in San Francisco. Studied at San Diego State College and the University of California.

Hugh S. Taylor. Resigned chairman of the department of chemistry at Princeton after 25 years. Continues as dean of the graduate school. To assume active direction of program in chemical kinetics at James Forrestal Research Center. Known for his work in catalysis, photochemistry, radio-chemistry and chemical kinetics. President of Sigma Xi.

N. H. Furman. Chairman of Princeton's department of chemistry. President of ACS. Specialist in analytical chemistry, particularly modern physico-chemical methods. Graduate of Princeton (Ph.D. 1918). Joined Princeton faculty in 1919.

Monte C. Throdahl. Assistant director of research, Monsanto Chemical Co., Nitro, W. Va. Previous Nitro positions: control chemist; research group leader; research supervisor for rubber chemicals; liaison officer between Nitro research and the rubber service department sales office, Akron. Graduate of Iowa State College.

Kenneth L. Godfrey. Research group leader, Monsanto Chemical Co., Nitro, W. Va. Previous Nitro positions: control chemist; research chemist in the field of organic synthesis with emphasis on oil additives. Graduate of Brown University.

A. Michaud. Assistant to the technical reports director, Kellex Corp., New York. Formerly, member of the staff of *Oil, Paint & Drug Reporter*. Graduate of the University of Illinois.

T. H. Glynn Michael. Chairman, Toronto section, Chemical Institute of Canada. Associated with Woburn Chemicals Ltd.

Wilbur G. McBurney, Jr. Liaison officer for Dow's technical service and development department and the petroleum industry. Formerly: in pilot plant and production operations for Koppers Co.; in the research and development division of Socony-Vacuum. Graduate of the University of Pittsburgh.

Martin T. Bennett. Member of five-man board administering new law requiring the licensing of practicing engineering in the District of Columbia. Chemical engineering consultant. Formerly: chief of the gas production division of WPB; chief of staff to the reparations commissions to the Far East.

M. T. Bennett

R. T. Major

Randolph T. Major. To receive the 1951 Medal of the Industrial Research Institute. Vice president and scientific director of Merck and Co. Joined Merck in 1929. Graduate of the University of Nebraska; doctorate in organic chemistry, Princeton; studied at Pasteur Institute, Paris, and Pharmazeutische Institut, Berlin.

William L. Campbell. Vice president, Food Machinery and Chemical Corp. Formerly head of the food technology department of MIT. During World War II: vice president of the American Machine Defense Corp.; assistant deputy rubber director. From 1932 to 1942, general manager and later vice president and director of Kroeger Grocery and Baking Co. Studied at Yale and MIT.

William F. Kilgannon, Eugene Garfield and **Joseph Licht.** Research assistants, Evans Research & Development Corp. Recent graduates of Fordham, Columbia and Polytechnic Institute of Brooklyn, respectively.

John Rogers. Chairman, Britain's Imperial Chemical Industries; has been deputy chairman since 1940. Associated with ICI and its predecessors since 1899.

George J. Ritter. Retired after 30

(Continued)

years as a chemist at the U. S. Forest Products Laboratory, Madison, Wis. Graduate of the University of Wisconsin.

W. Alan Wright. Director of medical service, antibiotics division, Chas. Pfizer & Co. Formerly associate director of clinical research, Schering Corp., Bloomfield, N. J. Studied at Juniata College and Temple.

Harold Naidus. Director of research, American Polymer Corp., Peabody, Mass. Chief engineer: **Max Potash.**

G. W. Seymour. Coordinator of development, Celanese Corp. of America. To direct integration of all development work in process in the various departments of plants of the corporation.

George W. Koch. To supervise laboratories of Stanley Drug Products Co., Portland, Ore. Formerly associated with the city of New York as head chemist.

OBITUARIES

Emory S. Morris, 68, president and founder of Ni-Late Co., died in Atlanta December 12.

James H. Allen, 70, vice chairman of the board of St. Regis Paper Co., died in Pensacola December 18.

Joseph G. Smith, 45, junior engineer on production research for Humble Oil & Refining Co., died in Houston, December 19.

William B. Bell, 72 president of American Cyanamid Co. since 1922, died at Marrakeech, French Morocco, December 20. Mr. Bell was awarded the Chemical Industry's Medal in 1934 for distinguished economic service to the chemical industry.

David S. Nantz, 49, general manager of the National Distillers Chemical Corp. metallic sodium plant at Ashtabula, died December 21. Before joining National Distillers in 1949, he had been associated with the Niagara Falls plant of Du Pont's electrochemical department for 20 years.

Richard H. Thomas, 87, founder and chairman of the board of Hamilton-Thomas Corp., Hamilton, Ohio, died December 30.

James H. Mallory, 78, retired chemist for the Coca Cola Co., died in Atlanta January 3.

INDUSTRIAL NOTES

NEW FACILITIES

Monsanto Chemical Co.'s western division—A branch office in St. Louis to handle sales and distribution of its resin-based surface coatings in the area east of the Rockies.

Howe Scale Co., Rutland, Vt.—Branch offices at Denver and Houston to provide sales, service and warehouse facilities. Daniel O. Ferris and Henry K. Leonard, respectively, are in charge of the offices.

General Controls Co.—A factory branch sales office in Indianapolis. Richard H. Weber has been appointed to handle the West Coast manufacturer's automatic pressure, temperature, level and flow controls in that area.

Westinghouse Electric Corp., Pittsburgh, Pa.—A plant for the manufacture of Micarta at Hampton, S. C.

Lewis-Shepard Products Inc., Watertown, Mass.—A sales and service office in North Bergen, N. J., to handle its materials handling equipment in the New York-New Jersey areas.

National Lead Co.—Research center and office building in Houston scheduled to open in July.

Blaw-Knox Construction Co., Pittsburgh—An additional engineering-office building in Pittsburgh to be finished in October.

National Molded Piping Distributors, Jersey City, N. J.—Free advisory service on use of corrosion-resistant materials particularly plastics and alloy steels.

Quaker Rubber Corp., Philadelphia—A $1.5 million expansion of plant and manufacturing facilities. Capacity for finished rubber products will be increased by 30 percent.

Stewart Hartshorn Co., New York—An industrial division to handle its resin-bonded fabrics and paper and precision metal and wood parts.

National Tube Co.—A large extrusion plant in Gary, Ind., for the manufacture of high alloy seamless specialty tubes, as well as shapes and bars. Production is slated to begin by the end of the year.

NEW COMPANIES

Chemical Research Associates, Barnardsville, N. J., to act as chemical consultants and undertake all phases of chemical development from basic research, process and product research, testing and analysis, market research, process and product development, pilot plant design and operation. The associates are: Jacobus Rinse, a partner in the Rinse & Dorst firm of chemical consultants, Haarlem, Netherlands; Auguste Rooseboom, formerly with Royal Dutch Shell Co.; John van der Valk, formerly director of research and development for Shell in England; John C. van Dyk, formerly vice president of John de Kuhper & Sons, Jersey City, N. J.

Reliance Electric & Engineering (Canada) Ltd., Welland, Ontario, a successor to the Commonwealth Electric Corp., Ltd., manufacturer of alternating current motors and transformers.

Gaudreau, Rimbach & Associates, Pittsburgh, Pa., to specialize in plant layout, warehouse planning, material handling and production control.

NEW LOCATIONS

Walker-Wallace Inc., producer of plate heat exchangers and pasteurizers, has moved to 137 Arthur St., Buffalo, N. Y.

Flexible Tubing Corp. has moved to a new plant at Guilford, Conn.

Blaw Knox Construction Co. has moved its Tulsa offices to 5th St. and Kenosha Ave.

NEW REPRESENTATIVES

Troy Engine & Machine Co., Troy Pa., has appointed A. C. Nispel, Inc., Boston, New England representative for its line of roller mills, colloid mills and mixers.

Barry Corp., Watertown, Mass., has appointed Sterling Sales Corp., Detroit, to handle its equipment for shock and vibration control.

Thomas C. Wilson, Inc., Long Island City, N. Y., has appointed Tate Engineering and Supply Co. to handle sales of tube cleaners and expanders in Maryland. —*End*

Thomas D. Cabot tells . . .

"There is no conflict between a director's desire to aid his country in its struggle against the plotters in the Kremlin and his desire to make long range profits."

"Research is strategic, not tactical in the business race."

"We expect to expand further in spite of, or perhaps it is because of, higher taxes."

How Directors Look at Research

Today research is generally recognized as the principal tool of competition. Everyone is interested in it. Nevertheless it is still undersold.

The directors of a company are supposed to look at their company primarily from the standpoint of finance. Some boards are told so little by management that they can't look at their company any other way. My own experience as an outside director—that is, one not in the management—leads me to believe that directors are eager to delve far beyond the financial figures and into the real decisions of management. If I here attempt to outline how a director should view research, I shall assume that he is a director who is given a chance to view it and that he is a man of broad experience in business but not a scientist or research manager. Such a director is usually not in a position to help much in deciding which research projects are worth their cost, but he can be very helpful in deciding how much of the total budget can be allocated prudently to research and development.

Of course, an outside director has no power except at a board meeting. Nevertheless his informal opinion expressed between times, often in casual conversation with a member of the management, can cause changes which have profound effects. As the owners' representative, he keeps the management watchful of the stockholders' interest in profits. Rarely does this mean that he wants quick profits. He recognizes better than most men that it is not what you can make but what you can keep that counts. You can expect the outside director to be especially interested in long range plans.

The present emergency places new responsibilities on directors to consider how their company can help. Clearly research is making a great contribution toward defending us from foreign domination. Most research projects have a purpose which strengthens us for war or peace. For the long pull improvement in productivity is of equal importance with improvement in military strength. There is no conflict between a director's desire to aid his country in its struggle against the plotters in the Kremlin and his desire to make long range profits. Increasing a company's ability to serve its customers' wants achieves both goals.

Research is strategic rather than tactical in the business race. It is of little help to the company which wants a "fast buck." It is not a business stimulant but nourishment for steady solid growth.

It seems likely that, for a number of years to come, any really profitable and growing company can expect to keep not more than twenty-five cents of each additional dollar of operating profit. With this prospect, one may wonder why a board is interested in taking further risks to seek larger profits. Directors are expected to appraise risks and weigh them against prospects. Few prospects are good enough to outweigh a loading of four or five to one. In the days before taxes, the stock of a project which was burdened with 75 or 80 percent of "water" for the promoters would have looked a bit risky at best, especially for a trustee investing other people's money, and yet that is the kind of investment that every new project presents to the directors of a corporation nowadays. Why then does anyone spend money on research to develop projects for future investment? If it were my own money, that is to say money which had already passed through the tax wringer, I wouldn't. Yet I just said research was undersold. The explanation of this paradox is that when a profitable company spends money on research it is charged to expense. It is a deduction from taxable income. Yet successful research builds values. The company then may be buying permanent values with money which would otherwise go largely for taxes.

Poor research is no good as an investment. We mustn't delude ourselves that there is necessarily a direct relationship between the size of the appropriations and the value of the results. To view hopefully the hitherto unobtainable is an auspicious trait. Yet I suspect that the manufacturer who uses this as the prime criterion for selecting his research staff will do well to make sure there is also accumulated knowledge of the failures in the field. You can't expect to duplicate every month the profitable new discoveries of Du Pont, such as nylon and cellophane, and there is little use in hiring a chemist, giving him some test tubes and expecting quick results.

Great inventions have been made in the home workshop or even in the family kitchen, but technological progress today nearly always depends on systematic study. You must have good

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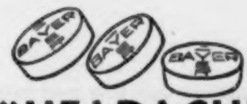
HELPS BAYER CURE A BLENDING "HEADACHE"



Two stainless steel, 10-cubic foot blenders installed by Bayer Aspirin Co.

Large access openings make loading a simple operation.

Smooth interior permits thorough cleaning in a matter of minutes.

Bayer Aspirin Company, determined to maintain the world-famous Bayer standard of quality on an improved, though hard-to-blend aspirin compound, selected two **p-k** Twin Shell Blenders* for this extremely important operation. These Blenders completely eliminated tableting and separation problems which occurred with overblending in other blenders.

A **p-k** Twin Shell Blender mixes dry materials faster and more thoroughly than any other blender on the market. Blender capacities range from 1 to 300 cubic feet; speeds, from 6 to 29 rpm. Mixing time varies with different products, of course, but is consistently shorter than any other blender.

p-k will run experimental mixes of your material without cost or obligation. It will introduce you to a new and accepted theory of dry blending.

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p-k *70 years of heat transfer experience assures you of superior design and construction*

p-k Mixers	p-k Sulfonators	p-k Lube Oil Coolers
p-k Coolers	p-k Brine Heaters	p-k Lube Oil Heaters
p-k Kettles	p-k Brine Coolers	p-k Reaction Vessels
p-k Agitators	p-k Freon Coolers	p-k Instantaneous Heaters
p-k Nitrators	p-k Soap Crutchers	p-k Quenching Oil Coolers
p-k Reboilers	p-k Ribbon Blenders	p-k Storage Heaters
p-k Autoclaves	p-k Fuel Oil Heaters	p-k Refrigerant Condensers
p-k Condensers	p-k Vapor Condensers	p-k Twin Shell Blenders*
p-k Evaporators		* Patented

the **Patterson-Kelley Co. Inc.**

20 Lackawanna Ave. East Stroudsburg, Pa.

101 Park Avenue New York 17	Railway Exchange Building Chicago 4	1700 Walnut Street Philadelphia 3	96-A Huntington Avenue Boston 16

men, and you must have good tools. Science depends on special knowledge and on accurate measurement. Hit or miss investigations rarely produce results. These things I know from seeing research money wasted.

My own company has a considerable research staff engaged in improving products and processes of the carbon black business. We have been expanding it in recent years and expect to expand it further in spite of, or perhaps it is because of, higher taxes. We are spending on research and development about 4 percent of our gross sales. A relatively small proportion of this is on pure research, and a relatively high proportion is on development.

A director representing the point of view of an investor is especially conscious of the rise and fall of industries and companies. He is inclined to view research as insurance against obsolescence. He knows well that change is inevitable and that a company with a strong research department is better equipped to meet and conquer the changes as they come.

But no research is any good that isn't used. Research results usually can't be translated into profits unless the directors divert money from dividends into new investment. Some of you may be asking yourselves what chance you have of getting new developments into production while there is a tax burden upsetting all balance of risk and profit. If your product is necessary to a war economy, this is not a problem, for our government may restore the balance through plant lease, accelerated depreciation or contracts for the product. But let us assume that your development is not a war necessity. The criteria by which such a commercial undertaking would be appraised in ordinary times have lesser weight now under a war economy, but they are still important. The lack of risk capital makes less competition for the consumer's dollar, and thus it is possible to get a higher operating profit. Market risks are less than when sales resistance rules. You can probably forecast the size and stability of earnings with more precision and can promise longer continuity of earnings from a consumer product than when sale rather than output is the limiting factor. Nevertheless risk capital will probably be hard to get, and this means that projects will have to be good to interest the board in making an important new investment.

The inducement to raise dividends is usually less in wartime, and if your company has a high rate of cash generation, your directors may prefer to invest this in new plant rather than pay it out to stockholders or risk possible tax penalties from unreasonable accumulation. If you succeed in getting a certificate of necessity, which permits rapid depreciation of a war facility, the depreciation money thus provided may later be available for new plant. In this case it would probably be well to spend pre-tax money now on research for the development of a business for which new plant investment will be needed later.

Anyway the emergency can't last forever. If we aren't going to have communism or socialism, someday we will see taxes below 75 percent of the new profit we can create from research.

Thomas D. Cabot, Godfrey L. Cabot, Inc., before the New England Council, Boston, Oct. 4, 1950.

THE WORK

1. Determination of Optimum Operating Conditions
2. Cost Analyses of Current Operations
3. Economic Analyses of Proposed Revamp of Present Equipment
4. Economic Analyses of Proposed New Facilities
5. Economic Evaluation of Research Projects

THE TOOLS

1. Process Data
2. Raw Materials and Product Analyses and Specifications
3. Cost Data
4. Construction Costs
5. Literature Data — New Processes

THE MAN

1. Unbiased
2. Patient
3. Willing to Study All Angles
4. Has Sound Judgement
5. Likes Desk Work
6. Trustworthy
7. Accurate
8. Neat
9. Has Initiative
10. Alert
11. Tactful

Chemical Engineering Economics—What It Holds for You

Roscoe Stahl and John E. Kasch

The Work

Let us first examine the type of work that chemical engineers specializing in economics do. The first general type of work, determination of optimum operating conditions involves the analysis of all the variables of the operation of the processing units, individually and collectively. This sometimes runs into quite a job particularly in a petroleum refinery where a tremendous number of intermediate products are produced from different refining units for further processing. Almost any valve that is turned in one unit will affect some other unit either back the line two or three units or on down the line another two or three units. For instance the production of a gas oil from a crude pipe still or thermal cracking unit will affect the raw material available for a catalytic cracking unit which in turn will affect the amount of butylenes that are available for alkylation to produce aviation gasoline. The production of this high octane gasoline will turn affect the amount of total gasoline that must be made within the refinery to meet the sales demand of the company. Sometimes, seemingly endless circles of calculations are nec-

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essary to establish optimum operating conditions for all processing units collectively. In addition to calculating accurately the changes in operating conditions and flow rates, the influence of market conditions and product specifications must be taken into account. Market prices for various products change with the season and from year to year. Thus, optimum operating conditions must be determined for both relatively short range and long range cases.

The second general type of work, cost analyses of current operations, is the calculation of the cost of manufacturing a given product with presently installed facilities. Here it is necessary to determine accurately the cost of manufacturing the product and the effect of its production on other products in the refinery.

The third type problem is the economic analysis of a proposed revamp of present equipment. These revamps are either for the purpose of increasing the charge rate, increasing the recovery of a specific product, or to permit improvement of the quality of a product. Such revamps of equipment cost from a few thousand dollars up to a few million dollars. In these calculations the amount of time that the processing unit will be out of production must be accounted for, as well as the change in product distribution.

The fourth type problem is the economics of adding new facilities to expand production, to improve quality of present products, or to produce a new product such as that developed by research. This is a major type and sometimes requires several man-months of work for completion of a single phase.

A fifth general type problem is the economic evaluation of research projects. This may be broken down into three general subdivisions. First, available data must be analyzed before laboratory work is attempted to guide consideration of the research project. At this point the project may be either emphasized or dropped. Following the laboratory work, an analysis is made of the required unit operations and processes to decide whether to go ahead with additional laboratory work or process development. This analysis may point the need for developing cheaper methods of processing, or the use of cheaper raw materials to meet competition. Proper analysis of research data at this point places emphasis on those projects which are likely to produce the greatest economic return. After completion of the pilot work another economic

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analysis is made of the process. This time the analysis is similar to and usually as comprehensive as a Type 4 problem.

One way of using the economic analysis is to determine the price of the new product necessary to pay off the capital cost of the facilities including working capital, manufacturing costs, and permit a reasonable rate of profit for the company. If the product already has an established market price the economic study will determine the length of time necessary to pay off the equipment. Payout time that will result in a company's investing in the new plant will depend on many factors. Sometimes a five-year payout on new facilities may be adequate, other times a one-year payout may be required. These decisions are influenced primarily by capital policies of the company and the estimated accuracy of the economic analyses including the estimated accuracy of the product demand and product price.

The Tools

Although this presents only a brief outline of the general types of work considered under chemical engineering economics, let's now skip to the tools which the chemical engineer must use in these various types of economic analyses. First and above all is process information. General correlations of processing operations are necessary. These may be based on commercial plant data or upon pilot plant data. Sometimes plant test data are obtained for the specific purpose of an economic analysis of the operation. Pilot plant data are specifically obtained for determining the effect of operating variables on present production units. In the case of new research projects, pilot plant data are quite desirable and usually necessary for determination of the economics of producing a new product. A large amount of correlating work is almost always necessary and many times this must be done by the economic analyst.

Another general tool used by the economics engineer: product and raw material data. The engineer must be thoroughly familiar with all raw materials analyses. All product specifications must be well known.

A third tool: cost data, other than equipment cost data. Accounting department cost data on current operations must be available and thoroughly analyzed. From these data the cost of incremental operations of present units must be determined for use in calculating out-of-pocket or incremental cost for unit operations. Basic data

on fuel and other utilities costs must be available. Included in this category are wage rates, cost of company benefit plans, insurance and annuities, etc. Cost of financing new facilities through the issuing of common and preferred stock and bonds, or borrowing from banks must be available. Product market prices and data on corporate income taxes are also needed.

The fourth general type of tool is equipment cost data. Here generalized costs of various types of processing units, say in terms of dollars or thousand dollars per daily barrel, must be available to the chemical engineer doing economic type calculations. This permits him to do a considerable amount of checking on equipment costs furnished by others or contemplating new equipment costs without going into the details of equipment design. Also under this fourth general item are specific cost data on individual components of construction. Fifth, the engineer in this type work must be in constant contact with the literature for new processes, process development construction methods, etc., that might affect his economic analyses. He must be constantly on the look out for market trends, price zones, and prices of related products.

The Man

Let's take a look at the personal characteristics in the chemical engineer that are helpful for success in this type work. Most of these qualifications could apply to chemical engineers engaged in any sort of work. However, a few may be outstanding in their specific application to this type work. First, the chemical engineer must be completely unbiased and honest, have great patience and willingness to study all angles of a given problem. Never jump to conclusions not founded on facts. He must have sound judgment in setting up the bases for his calculations. He must like desk work because this type work involves almost entirely desk work. It does not take an engineer out into the plant. He must be completely trustworthy since he will have access to most of the company's financial and cost data. He must be extremely accurate in all his calculations. A great help to this of course is neatness. Neatness many times dispels the possibility of making inaccurate calculations. It is extremely desirable for him to have considerable initiative to work with the minimum direct supervision on specific problems assigned to him. The ability to express ideas clearly, both orally, and in reports is extremely valuable. He must be alert and interested in all new

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developments, thinking about their application to his own company or work. If a person is tactful he can accomplish far more than by being blunt. Tactfulness should be used in communications with one's associates as well as with one's supervisors.

The next logical question to ask is how long does it take to get somewhere in this type work. This of course depends upon a variety of circumstances and depends upon the experience, adaptability, and application of the engineer to his problems just as to any other chemical engineering group. The future is wide open for a chemical engineer working in this field.

Roscoe Stahl and John E. Kasch, Pan American Refining Corp., before the South Texas Section, American Institute of Chemical Engineers, Oct. 27, 1950.

LUBRICATION

. . . *Paper Industry*

L. W. Miller

The paper making industry has some special lubricating problems. Many, however, are common to other industries. Motors, pumps, and power transmission equipment; contamination from excessive water and foreign materials; high relative speeds, pressures and heat conditions; some of these you all know. We have them in combination.

In addition, our operations are complicated by the over-all factor of continuous production. Twenty-four-hour days and seven-day weeks are standard. In another sense, we have continuous line production, where the failure of any one of many components brings the whole process to a stop.

All of our equipment requires lubrication and lubrication is not yet, or in the foreseeable future, an exact science.

Let's look into the matter of maximum oil temperature. Oil does not go bad all at once. Deterioration is a chain reaction, starting from oxidized nuclei, and is accelerated by elevated temperatures.

Consider a given quantity of this oil, not as a solid stream, but as several thousands of drops. Some drops will squirt right through, touching only other drops of oil. Some increments impinge upon and run off the housing and outer surfaces of the bearing. Other increments are caught between the rollers and races, and subjected to forces of unknown magnitude. Still other drops ride the journal,

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which in certain instances is known to be carrying steam at temperatures above 400 deg. F. All these increments join to emerge at a mean temperature of 130 deg. F.

There is a large area of obscurity in our knowledge of the effect of the kinetic energies of moving machine parts on their material components. The designer, who is on firm ground in designing a static structure, is in no such happy position when dealing with dynamic forces.

Scrutinize the available literature and formulas for the rolling contact bearing, for example, and you find it is based on empirical formulas. The manufacturer frankly states that 95 percent of his bearings will carry their rated load for their rated life.

In the case of an early bearing failure, there is at the present time, no way under heaven of determining whether we have one of the other 5 percent or whether we are doing something wrong with the good 95 percent.

It is in this dimly understood region of kinetic energies that lubrication operates. These dynamic forces make lubrication necessary, and the lubricant must minimize the wear and fatigue which are their natural effects.

Our chief weapon in combating these effects is oil, either alone or in combination with soaps and other additives. While the choice of an oil for a particular application is modified by many factors, its important basic characteristic is its ability to hold apart the surfaces subjected to these forces —in other words, its film strength. The film strength of a given oil is in general a function of its viscosity, and viscosity varies with every change in temperature. However, as a Newtonian liquid, the changes are consistent and predictable.

Realization of the complexity of the forces at work, together with the variations in the lubricant characteristics, points up the necessity for a lubricant specialist, familiar with operating conditions and lubricant characteristics.

The paper mill is no exception. Here we find modern high speed machines running side by side with older units. We find some older machines —altered, to be sure, in some respects —running at twice to three times their designed speed, and the limit is not in sight. Replacement of just one of

SLIDE-RULE TYCOONS

"By the year 2000 scientists and engineers will have infiltrated into and will manage practically all industry."

MILTON C. WHITAKER
Retired Vice President
American Cyanamid Co.

these units may represent an investment of millions of dollars. The alternative is to continue to run them, with increasing emphasis on preventive maintenance, and the firm base on which preventive maintenance stands is adequate lubrication.

—L. W. Miller, Scott Paper Co., before the Plant Maintenance Conf., Cleveland, Jan. 17, 1951.

PAINTING AND DECORATING

. . . *Pays Dividends*

A. D. Buschmann

During the past ten years, there has been an evolution in the industrial painting concepts, comparable in many ways to the introduction of modern production techniques in the manufacturing industry. Phrases such as color harmony, three dimensional seeing, color dynamics, and color conditioning have appeared on the scene. We talk about brightness engineering, color preferences, safety color codes, and a host of other factors influencing a new approach to today's industrial painting problems.

Why this emphasis on engineered color? Simply this—industrial painting has become functional and is now a matter of dollar and cents savings through increased production, reduced absenteeism, improved safety, better housekeeping, and higher employee morale.

The effectiveness of the scientific use of color is emphasized by the results achieved in all kinds of plants. For example, a joint study by the Public Buildings Administration in cooperation with the U.S. Public Health Service revealed an average increase in worker efficiency of 5.5 percent after proper color conditioning and task illumination in a punch card department of the Internal Revenue Bureau. As the section covered by this study employed 95 people, the yearly payroll savings, due to the increased efficiency, amounted to over $13,000.

We could find many other examples of dollar savings which definitely take industrial painting out of the "nicety" class and into the "essential" group of maintenance services. The question becomes not, "How much will painting cost?" but, "Can we afford to pass up the savings of a scientific painting program?"

Probably the most important phase of color conditioning is the control of brightness, light intensity and glare. The human eye is a wonderful mechanism and can adjust to almost any

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seeing condition. When we walk into a darkened theatre, our eyes soon adjust to the seeing conditions; likewise, when we pass from a darkened area to bright sunlight, our eyes adjust again. If we were to subject our eyes to alternate bright and dark several times a minute, we would soon develop eye strain and probably a headache. Continuing we would become fatigued, nervous and even nauseated. Even so, it was only recently that an effort has been made to eliminate a similar condition confronting the industrial worker. The dark machines and walls, with a window or high intensity light source illuminating the work, made it necessary that the worker's eyes adjust each time he glanced from his work to the surroundings. This constant eye adjustment undoubtedly was responsible for considerable worker fatigue, headaches and absenteeism. Research has found that the brightness ratio should not exceed 1 to 10 or better yet, 1 to 5. The brightness ratio is a measure of the relative amount of light reflected from two surfaces. If the wall reflects 50 percent of the light striking the area and the machine 25 percent, then we have a brightness ratio of 50 to 25 or 2 to 1—well within safe limits. In the study made in the Internal Revenue offices, the original brightness ratios exceeded 100 to 1. After proper lighting, the brightness ratios were reduced to 40 to 1 and with scientific color application, the brightness ratios were reduced to less than 5 to 1 at the card machines and 8 to 1 in the entire room. No wonder the workers showed an increase in efficiency equalling a $13,000 yearly savings.

Tests have shown that everyone prefers color to black or gray. Further we find that most people prefer tones of blue, red and green, while violet, orange, and yellow are the least liked. Women prefer red, while men select blue as the favorite color. As we want the plant interior to be appealing, we must use the colors which are most preferred. We can even go further and provide red tints, such as peach or beige in areas predominately occupied by women and blue tints in areas occupied by men. Locker and toilet rooms are quite adaptable to these

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OPERATION ZERO

"Almost no new scientific men were trained between 1940 and 1945. In preparing for a possible future war, we must do better."

HENRY DEWOLF SMYTH
U. S. Atomic Energy Commission

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color schemes. At Perfection, we have used peach and rose tints in the women's locker and toilet rooms and blue green colors in the men's. The employees reaction to the appearance of their service facilities has been most satisfactory.

Let me emphasize that maintenance painting is functional in nature and is, therefore, a justifiable manufacturing expense that returns good dividends to the company. We can expect to realize important economic gains through:

1. A production increase or a reduction of scrap through better seeing.
2. Less absenteeism and more concentration on the job through elimination of eyestrain, headaches and the related ails.
3. Better housekeeping because of worker pride in clean and pleasant surroundings and a natural tendency to keep a clean area clean.
4. A reduction in accident frequency through improved seeing and the safety color code.
5. Improved employee morale because of these and other aspects of a complete color conditioning program.

Color, properly used and properly applied, can, and should, be a part of our plans for promoting a more efficient production program in 1951 and throughout the years to come.

A. D. Buschmann, Perfection Stove Co., before Plant Maintenance Conf., Cleveland, Jan. 17, 1951.

INDUSTRIAL FLOORS

. . . Use and Abuse

E. F. Mumaw

Industrial floors probably receive more abuse and less consideration than any of the other facilities used in connection with manufacturing processes.

In an industrial plant bad floors are an important factor in the cost of damaged goods in either the rough or finished state. A hard jar from a sudden bump or a toppled truck will result in a damaged unit that can be very costly, and bad floors soon show up in increased maintenance costs on mechanized equipment. Floors in poor condition are the principal cause

STICK, STACK, STUCK

"Chemical industry today can no more afford the risks of sticking to traditional policies in relationships with the public, that were good 50 years ago, than it can afford to go back to making sulphuric acid in large lead chambers."

DWIGHT MOODY, *Chemical Editor*
N. Y. Journal of Commerce

WHAT'S IN A NAME?

"So much of chemical engineering is physical as well as chemical that it appears that the expression "Process Engineering" might be a more pertinent designation for what we now know as chemical engineering."

George Granger Brown
Univ. of Michigan

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of cut tires thus reducing their normal life span, and figures show a marked difference in the life and maintenance of truck batteries when smooth floors are used.

Our floor installation costs have been greatly reduced by our maintenance departments through several methods:

1. Make sure the man installing a floor is well acquainted with the material he is using.
2. Let him know that his good work and skill are appreciated.
3. Explain to him why you are making the installation and encourage suggestions relative to efficiency and quality of work.
4. See that he has the proper tools and equipment to work with.

The best floor inspector in any plant is the production supervisor. He is always on the alert for hazardous conditions in his section which might hamper his production. Usually working in conjunction with him is the materials handling department, whose job is to keep component production parts rolling. Dangerous floor conditions play a major part in disrupting scheduled delivery systems; therefore, periodic floor inspections are essential in order to provide advance notice of potential bad floor conditions, so that swift repairs may be made before such conditions develop.

With regard to floor cleaning, programs should be studied carefully so that effective application can be made, and personnel assigned this type of work should be instructed as to its importance. The maintenance supervisor in the cleaning section should be cognizant of cleaning procedure and should keep abreast of new and improved cleaning methods. Industrial waste allowed to accumulate on the floor will soon become a hazard to foot traffic and if not cleaned at regular intervals will hasten the disintegration of the floor. This is especially true in heavy traffic areas. A power driven rotary scarifying tool has been tested and found to be successful in removing all types of foreign wastes from wood block, brick, concrete, etc. This device not only cleans the floor but leaves an even surface.

E. F. Mumaw, Ford Motor Co., before the Plant Maintenance Conf., Cleveland, Jan. 17, 1951.

—End

A Course in Nuclear Technology

In Atomic Year VII, in the world of the nuclear physicists where acceleration is measured in terms of light and temperatures reach those of the sun, it's tough for engineers to keep up intelligently. And keep up we must even though our personal experiences with radioactivity are limited to newspaper headlines, popular explanations and infrequent submission to the dentist's x-ray. (Let's continue to hope that most of our contacts with nucleonics don't become vividly personal.)

So this month let us look at five recent books that are concerned with five different angles of atomistics. Inevitably they are somewhat overlapping. But the duplication isn't serious. And if you have read this page of *Chemcial Engineering* as far as here, you'll be interested in all of them. The quintet will make a fine addition to your library shelf alongside your Smyth report. The five categories, roughly, are: history, nuclear physics, industrial problems, economic aspects, and terminology.—*LBP* WITH ASSISTS BY *RVR*

History

NEW ATOMS. By Otto Hahn. Edited by W. Gaade. Elsevier, New York. 184 pages. \$1.75.

In 1944 Otto Hahn won the Nobel prize because he discovered uranium fission. He received the prize in 1946 and his Nobel address was a fine recounting of a small bit of history—background history touching on theories, personalities, drudgery and discovery. There was a trace of philosophy, too. The talk is translated and preserved as the first chapter of New Atoms. The second and third chapters are lectures, but don't let that scare you. A nice conversational style makes easy reading about (1) the chain reaction—including the H bomb and (2) the ten new artificial new elements—four recently filled gaps in the periodic table and six newcomers beyond uranium. The last chapter of this small, easily read book is autobiography. It's a too brief mixture of men and atoms, of memories and work. You can read the whole book—so well translated by Dr. Gaade—in an hour or so. And you will be well repaid if you have the slightest interest in chemical history, nucleonics or chemistry.

Nuclear Physics

APPLIED NUCLEAR PHYSICS. Second edition. By Ernest Pollard and William L. Davidson. John Wiley & Sons, New York. 352 pages. \$5.

In atomic year VII, a book dates fast. In fact, the timeliness of a book published in 1942 went up with the mushrooming cloud over Alamagordo. That's a pretty good reason for a new and second edition of Applied Nuclear Physics.

Aimed at the neglected group of technical men who aren't especially enamoured of differential equations and, on the other hand, can't find much reward in the after-dinner kind of nuclear science for the layman, the book fills a definite need: to teach the chemical engineer something about a new branch of chemical engineering, the doctor about a new branch of medicine, the biologist about a new branch of biology, *et cetera ad scientiam*. For the process engineer doesn't have to be clairvoyant to realize that in a very few years radioactive tracers will be getting further into the processing kettles and swimming around with the atoms, telling the engineer things about kinetics and dynamics—things that were beyond the dreams of even the alchemists.

Applied Nuclear Physics is readable, and it's technical—in the best sense of the word—vastly clarifying, informative and it provides the creative mind with the provoking insights that lead to inventions and improvements. Yet it is never dull, academic, stilted as are so many other texts which waste so much of the publisher's materials and the reader's time.

The college sophomore as well as the plant engineer, will find a careful reading and rereading of the text as rewarding as any two or three point course in the average university.

The book prescinds from a consideration of, and a preoccupation with, atomic weapons, and that is as it should be. One of the authors comes from industry, the other from education—each with the mettle that makes for happy alloying.

Industrial Problems

INDUSTRIAL AND SAFETY PROBLEMS OF NUCLEAR TECHNOLOGY. Edited by Morris H. Shamos and Sidney G. Roth. Harper & Brothers, New York. 368 pages. \$4.

Just about a year ago a three-day conference was sponsored by AEC and the Division of General Education at NYU. A limited group of representatives heard discussions by 21 experts talk about (1) organization and operation of the AEC, (2) radiochemistry and isotopes, (3) radiochemical laboratories, (4) hazards, safety and insurance.

You and I were not invited to the conference. But we can find out what went on. Shamos and Roth edited all the papers and Harper has published them. They are worth perusal or study, depending on your interests. They will (1) suggest where you can use isotopes in measuring and tracing, (2) help plan experiments and design laboratories, (3) evaluate hazards, (4) tell what to do about wastes. Other subjects included: Status of non-military atomic energy development, contracts with AEC, patents, insurance problems.

The conference was directed at the "intelligent layman." Most of us qualify, don't we?

Economic Aspects

ECONOMIC ASPECTS OF ATOMIC POWER. By Sam H. Schurr and Jacob Marschak, Editors-in-Chief. Princeton University Press. 289 pages. \$6.

Like Jupiter on Mount Olympus, many of our engineering executives have kept to their towers of concrete, complacently watching the doings of this atomic child in swaddling clothes. Hell! Atomics are for the merchants of death, not the captains of industry! Sure, this byproduct toy, atomic power from the heat of the reactors is intriguing, but a lot of important people had decided it couldn't be done.

Time, Inc., even made one of its March-of-Time documentaries which ended with Harvard's Dr. Conant impressively closing the symposium by voicing the overwhelming

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The Laboratory's purpose is to develop new or more efficient processing methods . . . to determine the economics of a process prior to full scale production . . . to provide engineering information to guide in the designing of efficient plants.

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LAB TESTS INCREASE PRODUCT YIELD 60%

A plastics manufacturer had to find a method of reducing fines loss in grinding a product. As much as half the material was being lost as fines in grinding to between 20 and 35 mesh. Unless a way could be found to reduce this loss the process would not be economical.

This problem was brought to the Basic Industries Laboratory where tests with several grinding devices indicated that the use of corrugated rolls would be a solution. A method was worked out for stage crushing this material so that the loss as fines was reduced from 50% to 20% — an increase in salable product of 60%!

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Allis-Chalmers
Milwaukee 1, Wis.

32-page Bulletin 07B6419B Describing the Facilities of the Basic Industries Research Laboratory . . .

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majority opinion: Impossible. Radioactivity simply would not permit it.

It can probably be safely said that every worthwhile communication on the subject has found its way through the authors' screening process to emerge as a statement of fact, an opinion, or a quote.

The dominant impression that the book will leave with most readers is this: Energy of a low order, derived from the heat of nuclear reactors (atomic piles) and converted to electrical energy is practicable, economic and certain to supplement the coal used currently after a long, long time.

In a nutshell: (a) There are enough "definitely minable" reserves of uranium and thorium to produce electric power at the 1946 level of output in the U.S. for 1,000 years, enough "probably minable" reserves for 10,000 years. (b) Despite having looked long and hard for a trick method of getting electrical energy directly from the chain reaction, none has been found, so that at least for the present, the route must be a difficult heat transfer process via a conventional steam turbine or some form of gas turbine. (c) Atomic power at the lowest conceivable cost would be the cost equivalent of ordinary thermal power based on a costless fuel. (Taking coal at $5 a ton, even at worst, the saving would be tremendous.)

The book handles economic analyses of key industries and its estimates of the possible effects of the advent of atomic power on these industries, namely electric power, aluminum, chlorine, caustic, phosphate fertilizer, cement, brick, flat glass, coal, oil, iron and steel, railroad transportation and residential heating.

The work is called an exploratory study—and that's what it is. The author's probes go deep however and the book is not wanting in some very shrewd guesses with regard to comparable costs of, and predictions for, atomic power.

Terminology

> POCKET ENCYCLOPEDIA OF ATOMIC ENERGY. By Frank Gaynor. Philosophical Library, New York. 204 pages. $7.50.

Jivesters, doctors, chorus girls and nuclear physicists—they all have their private languages composed of highly specialized terms plus varying amounts of English. There are dictionaries of bop, medicine, slang. And now that we have Gaynor's book there is a dictionary of nucleonics. He has taken two kilos of words, abbreviations, terms, elements, laws from the nuclear tongue and given us defini-

tions. These were spiced with a few short biographies. The whole becomes an ideal solution to questions ranging from A-bombs to zirconium. What are fish tracks, rems, Q-levels, stars, amus? Read Gaynor and find the private meanings these terms have in Oak Ridge, Hanford, Harwell and Atomgrad. Read Gaynor if you run across any words that give you trouble in any of the four books we have told you about above.

RECENT BOOKS RECEIVED

The Analytical Balance. By W. M. MacNevin. Handbook Publishers. $1.50.
Applied Nuclear Physics. By E. Pollard & W. L. Davidson. Wiley. $5.
Crystal Growth. By H. E. Buckley. Wiley. $9.
The Engineering Method. By J. C. L. Fish. Stanford. $3.
The Engineering Profession. 2nd ed. By T. J. Hoover & J. C. L. Fish. Stanford. $7.50.
Heterocyclic Compounds. Vo. 11. By R. C. Elderfield. Wiley. $15.
Identification of Molecular Spectra. 2nd Ed. By R. W. B. Pearse & A. G. Gaydon. Wiley. $8.50.
Indium. By M. T. Ludwick. Indium Corp. of America.
Industrial Solvents. 2nd ed. By T. Mellan. Reinhold. $12.
Methods of Analysis of the AOAC. 7th ed. $10.
Radiation Monitoring in Atomic Defense. By D. E. Gray & J. H. Martens. Van Nostrand. $2.
The Technique of Executive Leadership. By J. F. Bender. McGraw-Hill. $3.50.
Toxicology of Uranium. By A. Tannenbaum. McGraw-Hill. $3.

More Nucleonics

Atomic Physics. By Wolfgang Finkelnburg. McGraw-Hill Book Co., New York. 497 pages. $6.50.

Reviewed by G. F. Kinney

This new title for the International Series in Pure and Applied Physics treats of the elementary particles in a concise and systematic manner. It is eminently suited for use as a text for graduate students, and perhaps for undergraduate majors in physics. The treatment emphasizes the pictorial concepts and theoretical relationships, utilizing very little mathematics. After a brief discussion of atomic structure, the atomic spectra and the elements of quantum mechanics are treated in detail, but from a descriptive viewpoint. Following chapters are devoted to nuclear physics, to molecular spectra, and to the physics of the solid state.

The book is a translation of the German edition, first printed in 1948, with additional description of some recent developments such as the transistor. Its material should provide the

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Amberlites

ION EXCHANGE RESINS. By Robert Kunin and Robert J. Myers. John Wiley & Sons, New York. 212 pages. $4.75.

Reviewed by E. W. McChesney

The complexity of the ion exchange field makes it difficult for many individuals to become adequately acquainted with the whole, and makes welcome this contribution by two individuals who are well qualified for the task. This text is only about half the length of the monograph on the same subject edited by Dr. Nachod and has, therefore, certain limitations which must be taken into account. It gives somewhat more information about the synthesis of the several types of resins, but considerably less about such topics as desalting sea water, ion exchange in sugar refining, catalytic applications, recovery of alkaloids, and separations of amino acids. To some of these topics a paragraph or a page is devoted.

The subject matter is treated lucidly, in somewhat essay-style, and as thoroughly as space limitations permit. There are 615 literature references and 104 line cuts. It is perhaps only natural that most of the latter should deal with the various Amberlite resins. The text has been subjected to careful proofreading, and seems well adapted as a reference volume for research workers, particularly those interested in applying ion exchange resins in new areas, for those not acquainted with the ion exchange field, and as a guide for the engineer.

A Must

MCGRAW-HILL DIRECTORY OF CHEMICALS AND PRODUCERS. Stanley J. Alling, Publisher; Thomas L. Bonnitt, Manager. McGraw-Hill Publishing Co., New York. 558 pages. $20.

If you buy chemicals, this directory is your best source of supply. Product listings include raw materials, industrial and fine chemicals, dyestuffs and certain classes of semi-finished products (e.g., synthetic resins, metal powders, insecticides, etc.). Synonyms and trade names are cross-indexed to the most common name. Various grades of a particular chemical are given separate listings. Data on shipping labels (to conform with ICC regulations) are included, as is information on location of shipping points throughout the U. S.

A random product listing follows:

(Continued)

regulations) are included, as is information on location of shipping points throughout the U.S.

A random product listing follows:

ACETANILIDE
 Antifebrin; Acetyl Aniline
 crystals, powder
 25 lb. boxes, 25, 50, 100, 150, 200 lb. drums, bbls.
TECHNICAL, 98%
 Dow Chemical Co. (b)
 Maywood Chemical Works
 Sherwin-Williams Co. (b, i)
 Tennessee Eastman Corp. (a)
U.S.P.
 Dow Chemical Co. (b)
 Heyden Chemical Corp. (b)
 Mallinckrodt Chemical Works
 Maywood Chemical Works
 Monsanto, Organic Chemicals Div. (e)
 Chas. Pfizer & Co. (a,c,d)
REAGENT, M.P. 80/81 deg. C.
 Baker & Adamson (a)

Letters in parentheses after the firm's name indicate that particular division of the parent company which produces a specific product or grade of product.

Prime producers and manufacturers (including refiners and processors) are listed alphabetically in the second section of the directory. The address of the company, along with a breakdown of divisions is included.

An excerpt of one of the smaller listings follows:

VIRGINIA-CAROLINA CHEMICAL CORP.
 401 E. Main St.
 Richmond, Va.
 a) Charleston, S. C.
 b) Mt. Pleasant, Tenn.
 c) Nichols, Fla.

It might be added that all information has been checked and certified by an officer (or officers) of each company.

Recent Books & Pamphlets

Uranium. "Manual of Analytical Methods for the Determination of Uranium and Thorium in Their Ores." Compiled by the New Brunswick laboratory of AEC. 20 cents. Superintendent of Documents, Washington 25, D. C.

Coal. "Coal Resources of the United States." National summary circular. There will be other similar documents relating to the coal resources of various states. Each gives a reappraisal of the coal resources of the area with "reserve estimates presented by field, county, rank, thickness of bed and overburden, and reliability of information on which estimates are based." By Paul Averitt and Louise R. Berryhill. U. S. Geological Survey Circular 94, Superintendent of Documents, Washington 25, D. C.

Catalysis. "The Evaluation of Converters for Exothermic and Endothermic Catalytic Reactions Occurring Within Narrow Temperature Limits." Translated from a German article. By Gustav Wirth. Bureau of Mines, Information Circular 7587, Superintendent of Documents, Washington 25, D. C.

Underground Gasification. An English translation of an Italian report on post-war projects in Russia, Italy and Belgium. Tables, charts and graphic layouts of bore holes, control devices and top plant equipment. $1.50. Accurate Translation Service, 711 Woodward Bldg., Washington 5, D. C.

—End

NEW TECHNICAL LITERATURE

Reader Service numbers. Circle them on the postcard inside the back cover to get free booklets.

SUBJECT	FEATURES	COMPANY
Cooling 292A	Outlines the refrigeration and air condition equipment this company makes. Pictures some units including compressors, dehumidifier, air conditioners. Lists industries using them. 10 pages.	General Motors Co.
Storage Bins 292B	Bins constructed with diagonal-ended concrete staves and bound with galvanized steel hoops. Names 86 flowable bulk materials which can be handled. Tables give capacities. Photographs show typical installations. 12 pages.	Neff & Fry Co.
Valves 292C	Gate, Globe and swing check valves for handling corrosive media. Photographs, materials of construction, tables of list prices and dimensions, cross-sectional drawings for various models. Table indicates general resistance of four alloys to over 150 common corrosive agents. 20 pages.	Pacific Valves Inc.
Chemicals 292D	Compilation of data on several new chemicals which have become available from this company's research laboratories during the last year. They include: beta-substituted propionitriles, 3-substituted propylamines, dipropionitriles, 2-nitrodiphenylamine, 2-aminobenzenethiol, Antioxidant 2246, sodium dicyanamide.	American Cyanamid Co.
Pressure Vessels 292E	In tabular form, partial analysis of the 1950 ASME code for unfired pressure vessels and some comparisons with the 1949 code. Photographs show a few of this company's facilities and products. 8 pages.	Downingtown Iron Works
Strip Steel 292F	First issue of a quarterly house magazine to be called "Confab." For users of strip steel products. Will cover customer applications of company's methods and products; hints on proper stitching and strapping practices.	Acme Steel Co.
Pumps 292G	Condenser circulators, in standard sizes to 100,000 gpm. Designed for power station service, pumps described are vertical, mixed-flow units of large capacity and low head.	Economy Pumps, Inc.
Alloys 292H	Brief descriptions of alloys recommended for corrosion applications along with their physical properties and a guide to chemical agents best handled. 4 pages.	Ampco Metal Inc.
Instruments 292I	Photographs and brief descriptions of typical indicators, controllers and combustion safeguards produced by this company. 4 pages. Accompanying price list covering nearly all the company's products. 4 pages.	Wheelco Instruments Co.
Bearings 292J	"Bearings and Their Lubrication." Sections on types of bearings, friction, bearing design and materials, factors in the selection of a lubricant and methods of applying them, seals and closures, lubricant properties, grease lubricants, diagnosis of bearing failures. Picture sequences, construction photographs and sketches are plentiful. 64 pages.	Standard Oil Co.
Packaging 292K	Twenty-one ways of using Bakelite and Vinylite plastics and resins in packaging. Properties of the specific form suggested are listed with each application and a photograph shows one or more examples. 8 pages.	Bakelite Division
Pump Liners 292L	Slush pump liners: honed and satin finished, deep file hard case, forged special alloy steel. Cutaway photographs, price list and table of part numbers. 12 pages.	Mission Mfg. Co.
Concrete and Plaster 292M	Recommended mixes and methods of use for fireproof plaster and insulating concrete made from a perlite aggregate. Charts give properties; photographs show typical applications. 8 pages.	Great Lakes Carbon Corp.
Relays 292N	Diagrams and photographs show operating principle and construction of Mercury Plunger Relays and Sensitive Relays. 4 pages.	Ebert Electronics Corp.
Valves 292P	Valves for controlled spraying of lubricants onto open gearing, slide surfaces and other open bearing areas. Series of sketches shows operation. 4 pages.	Farval Corp.
History of Chemistry 292Q	Illustrated wall chart which presents the history of chemistry from its origins in China, India and Egypt to 1950.	Mallinkrodt Chemical Works
Paints 292R	Photographs and charts describe a comparative study of lithopone-alkyd coatings on steel panels, using different extenders and testing them in a saltfog chamber to their ultimate destruction. 6 pages.	Wet Ground Mica Assn., Inc.
Traps 292S	Float traps for steam and air service. Sketches show various models. Tables give sizes, capacities and prices. 4 pages.	V. D. Anderson Co.
Fire Safety 292T	Dry chemical wheeled engine for fighting industrial fires. Photographs show engine in use and from all angles. Operation is described. 4 pages.	American-LaFrance-Foamite Corp.
Electrodes 292U	Welding with bronze electrodes. For each member in the company's line of electrodes: typical applications, recommended welding techniques and procedures, machining suggestions, chemical composition, mechanical properties. Charts cover selection and preheating. 24 pages.	Ampco Metal, Inc.

(Continued)

New Technical Literature, cont. . .

SUBJECT	FEATURES	COMPANY
Transformers 294A	Air-cooled distribution transformers. Used in avoiding explosion and fire hazards; installation and maintenance. Photographs show various models and a cut away view of a transformer section. 4 pages.	Marcus Transformer Co.
Coatings 294B	Protective coatings for resisting chemicals based on: vinyl resins, phenolic resins; fish oils; chlorinated rubber. Also water emulsion coatings. Compositions, physical properties, photographs and descriptions of applications. 4 pages.	United Chromium, Inc.
Wax 294C	Procedures for testing microcrystalline waxes for melting point, viscosity, penetration, color. 6 pages.	Bareco Oil Co.
Instruments 294D	Electrodes, pH meters and accessories. Use of glass, reference and oxidation-reduction electrodes is discussed. Photographs and sketches show the line of meters and electrodes. 25 pages.	Beckman Instruments, Inc.
Bleaches 294E	"Optical Bleaches in Household Soaps and Detergents." By E. I. Stearns, T. F. Cooke and H. E. Millson. Physics, chemistry, application and color properties and test methods for the bleaches. 15 pages.	American Cyanamid Co.
Aluminum Pig 294F	Production of aluminum pig by the Hall electrolytic reduction process at company's Jones Mills, Ark., plant. Photographs show equipment. 12 pages.	Reynolds Metals Co.
O-Rings 294G	Lists dimensional and physical data for a series of O-Ring types including precision-molded industrial rings for air, water and hydraulic service; special formulations for use in sealing a wide variety of specific liquids, gases, oils and greases; special grades molded to meet aircraft requirements. 48 pages.	Parker Appliance Co.
Radioactivity Detectors 294H	British instruments and accessories for radio-isotope applications. Discussion of instrument requirements, lists of manufacturers and their products, consultants. Photographs and physical descriptions of various units. 44 pages.	Scientific Instrument Manufacturers Association
Wax 294I	Uses of wax in industry today especially in the manufacture of paper. General discussion of properties. 6 pages.	Bareco Oil Co.
Soot Blowers 294J	Photographs and diagrams show automatic sequential soot blower installations in central stations, including overall and sectional views. 24 pages.	Vulcan Soot Blower Corp.
Instruments 294K	Electronic master control system. Photographs show panels and indicators and plug-in amplifier unit. Blueprints show electronic link (master to actuator) and manual control circuit. 8 pages.	Republic Flow Meters Co.
Process Equipment 294L	Two bulletins. One pictures and briefly describes crushing machinery, milling equipment, laboratory machines, dry batch mixers, batch blenders, air separators, vibrating screens. Includes cutaway views and specifications chart. 8 pages. The other covers centrifugal separators with a usual fine-product range of from 40 to 400 mesh. Their most important function is to operate in closed-circuit with a pulverizer. Large, fully-labeled cutaway drawing shows parts. 4 pages.	Sturtevant Mill Co.
Instruments 294M	Chlorine gas meter designed to produce and deliver a chlorine-water solution to the point of application. Cabinet-type enclosure is constructed so that chlorine flow is visible. Labeled cutaway drawing shows construction and dimensions; flow diagram with color key shows operation. 4 pages.	Builders-Providence, Inc.
Mist Extractors 294N	Use of mist extractor unit in separation of liquid mist from gas or steam, injection well separators, oil and gas separators (low or high pressure), odorizers. Profusely illustrated with photographs, cutaway views, specification, capacity and performance charts, sketches and diagram sequences showing operation and construction. Includes price lists. 50 pages.	Peerless Mfg. Co.
Demineralizers 294P	Ion exchange systems ranging in capacity from 30 to 1,000 gph. Portfolio with eight catalog sheets, each containing a photographic illustration and working diagram of a particular model, a listing of parts, specifications and performance charts.	Penfield Mfg. Co.
Instruments 294Q	Two bulletins. One covers a flow meter especially suitable for high pressure applications. One large color-keyed schematic diagram shows operation and others show construction, mounting dimensions and ranges and installation data. 6 pages. The other bulletin covers relays which receive one, two, or three loading pressures and are used particularly in cascade control circuits. Charts give specific features and internal circuit diagrams of each model. Vertical and horizontal cross-sectional views show constructions. 6 pages.	Moore Products Co.
Metallic Soaps 294R	Metallic soaps (stearates), aluminum, barium, calcium, magnesium, zinc and zinc palmitate. Tables show the analysis, physical properties and solubility of each product.	Whittaker, Clark & Daniels, Inc.
Hydrogen Peroxide 294S	Details on the uses of hydrogen peroxide in the purification of process solutions containing metal salts. Applications described: electrolytic nickel plating, beryllium production, magnesium production, phosphatizing, optical glass production containing lanthanum salts, tin recovery from non-ferrous scrap. 4 pages.	Buffalo Electro-Chemical Co.
Machine Tools 294T	Air cylinder which combines cylinder, valve, valve operating controls and piston rod speed controls in one unit. Large photographs show parts and construction. Installation views, mounting information, dimensional drawings and charts. 24 pages.	Bellows Co.

(Continued)

A UNITAIRE CONDITIONER

TO MEET ALL YOUR REQUIREMENTS . . .

. . . for increased worker efficiency or customer comfort.

When you buy or specify the Westinghouse UNITAIRE, it will be:

- **SIZED TO FIT YOUR NEEDS.** The UNITAIRE is available in 2-, 3-, 5- and 7½ horsepower capacities.
- **DEPENDABLE.** You are assured of undivided responsibility for all major parts. The Westinghouse Hermetically-Sealed Compressor has an unequalled performance record in thousands of successful installations.
- **ECONOMICAL.** The elimination of belts, pulleys and shaft seals in the Hermetically-Sealed Compressor design means less maintenance and a longer, trouble-free service life.
- **ADAPTABLE.** The UNITAIRE can be installed alone, in multiples, or with duct systems. The addition of a heating coil provides year 'round air conditioning.
- **EASY TO INSTALL.** All sizes fit through a standard door, and require only water, electrical and drain connections before they are ready to operate.
- **COMPACT.** The largest UNITAIRE needs only a little over 8 square feet of floor space, can be fitted into recessed areas.
- **QUIET.** The UNITAIRE does not rise above the noise level of an ordinary store or office, and will permit you to shut off outside disturbances by closing doors and windows.
- **ATTRACTIVE.** Modern styling, clean lines and a two-toned gray finish make the UNITAIRE the smartest-looking unit on the market today.

For complete details, call the Westinghouse Air Conditioning Distributor listed in your classified telephone directory, or write Westinghouse Electric Corp., Air Conditioning Division, Hyde Park, Boston 36, Mass.

PUTTING *Air* TO WORK

Only Westinghouse can offer you a *complete* line of air conditioning, air handling and air cleaning equipment.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80224

New Technical Literature, *cont.* . .

SUBJECT	FEATURES	COMPANY
Mechanical Seals 296A	For leakless operation of a rotary shaft on a pump or other equipment. Photographs and sketches show several standard designs, their applications. Available in a range of materials. 12 pages.	Garlock Packing Co.
Instruments 296B	Pyrometer supply items, including assembled thermocouples, thermocouple wires, extension wires, protection tubes, insulators. Installation sketches, tables of calibration data for commonly-used base metal and rare metal thermocouples. Engineering data on modern practices in pyrometry. 56 pages.	Bristol Co.
Stainless 296C	Slide chart on workability of stainless steels. Includes a standard analysis table with corresponding AISI type numbers, relative fabricating data on the steels for a variety of operations, machinability as measured by a range of low and high speeds of turning. Properties, corrosion resistance, specifications for forging, annealing, hardening and drawing.	Carpenter Steel Co.
Valves 296D	Water pressure reducing valve. Chart shows general arrangement, with a detailed list of parts. Covers installation, operation, adjustment, servicing, specifications. Tables show general dimensions, approximate shipping weights, general list of materials. 6 pages.	Golden-Anderson Valve Specialty Co.
Driers 296E	Industrial and agricultural applications of over 30 types of driers. Installation and fabrication photographs. Covers continuous and batch driers, rotary kilns, coolers, calciners. 12 pages.	Standard Steel Corp.
Safety 296F	Protective equipment for the atomic energy field. Photographs and details on respiratory protective, air sampling and oxygen therapy equipment, ventilation accessories, protective clothing, materials for contamination control. 8 pages.	Mine Safety Appliances Co.
Synthetic Fibers 296G	Investment letter briefly discussing the properties, producers and future of Orlon, nylon, Fiber V, Dynel, Vicara. 4 pages.	L. F. Rothschild & Co.
Rare Chemicals 296H	Memo discusses this company's facilities for procuring rare chemicals to facilitate research. Lists many of the 3,000 products handled. Describes the extent of service. 2 pages.	Chemicals Procurement Co.
Paper Bags 296I	Suggested ways of using all types of multiwall paper bags. Picture sequences cover storage of empty bags, filling, closing and handling of filled bags, palletizing. 20 pages.	Bemis Bro. Bag Co.
Pallet Truck 296J	Electric pallet truck to handle loads up to 4,000 lb. Photographs of parts show construction and operation. Sketches give dimensions. 20 pages.	Towmotor Corp.
Electromagnet 296K	Unit for producing high flux density magnetic fields, weighing about two tons. Photographs, sketch showing section detail of yoke half. Table lists typical characteristics. 4 pages.	Arthur D. Little Inc.
Welding 296L	Specifications chart on almost 100 welding alloys. Data on composition, heating facilities which can be used, metals on which to use, type and preparation of joint, approximate heat and corrosion ratings. 6 pages.	Eutectic Welding Alloys Corp.
Fork Truck 296M	Specification and diagrammatic drawings of 2,000 lb. truck: extreme lift, 130 in.; free lift., 50½ in.; collapsed height, 83 in. 4 pages.	Mercury Mfg. Co.
Refrigeration 296N	Self-contained refrigeration units, this company's T-series, for testing, storing and processing. Charts on specifications and thermal properties of various materials. 4 pages.	Bowser Inc.
Electrical Accessories 296P	Voltage regulated power supply models. Four 1-page fliers cover four models. Each contains a photograph and detailed specifications.	Kepco Laboratories
Scale Models 296Q	Displays the range of occasions on which 3-dimensional planning has been and can be used. 8 pages.	"Visual" Planning Equipment Co.
Heater 296R	All steel unit for preheating feed water supply in small power plants of 300 hp or less. Cutaway view, dimensional diagrams, specifications and shipping weights. 2 pages.	Swartwout Co.
Instruments 296S	Dielectric type meter for determining moisture content in cotton seeds, nuts and other granular, powdered or flaked materials. Where it's been tested, how it works, what it does. 4 pages.	Weston Electrical Instrument Corp.
Pumps 296T	Chemical proportioning pumps, three basic models: synchronized, self-propelled and motorized drive. Design sketches, specifications and applications are given for each. 12 pages.	Nelson Chemical Pumps
Pulverizer Parts 296U	Manganese steel parts for crushing and pulverizing equipment. Includes photographs of coal crusher segments, gyratory crusher mantle with concaves, jaw crusher parts. 4 pages.	Taylor-Wharton Iron and Steel Co.
Antibiotics 296V	Specific descriptions of the effects of antibiotic-fortified feeds on the growth and livability of poultry and swine. Reports on experiments with penicillin, streptomycin, aureomycin and terramycin. Liberal use has been made of charts and graphs to show results. 32 pages.	Chas. Pfizer & Co.
Welding 296W	Hand torches for gas welding and cutting. Charts show correlation of tip, mixer, extension and torch; data is given for each component part. Cutaway views, welding and cutting pressure charts. 36 pages.	Air Reduction Sales Co.
Mat'ls Handling 296X	Pictures standard accessories for lift trucks for handling special types of loads. 4 pages.	Towmotor Corp.

(Continued)

NOW *Quimby Pumps* WITH WARREN SERVICE

WARREN-QUIMBY EXTERNAL GEAR AND BEARING SCREW PUMP

WARREN-QUIMBY ROTEX PUMP WITH EXTERNAL GEARS

Now you can look to Warren for Screw and Rotary pumps as well as Centrifugal and Reciprocating types.

Quimby built the first balanced quadruplicate screw pump in 1893. The salient design feature of separate screws and timed driving gears have never been changed. However, refinements through the years have widened the scope of applications to include the handling of any non-abrasive liquid or semi-liquid at moderate and high pressures.

The "Rotex" is a superior rotary pump of unique construction that has numerous applications where moderate pressures are involved.

We are glad to add these new members to the Warren family and invite your inquiries on any problem involving Screw and Rotary, Centrifugal or Reciprocating Pumps.

Both Screw and Rotex type pumps are available either horizontal or vertical mounted.

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS

New Technical Literature, cont. . .

SUBJECT	FEATURES	COMPANY
Bubble Trays 298A	Bubble trays and caps for fractionating towers. Trays are truss-supported, corrosion resistant, of light-weight alloy construction, fabricated in sections. Photographs and a series of sketches show assembly. 8 pages.	Gilbert & Barker Mfg. Co.
Steel 298B	Stainless steel in commercially rolled forms which resists hot sulphuric acid solutions. It is the same analysis as Durimet 20. Tables give working characteristics. General corrosion resistance to over 100 chemicals is described. Chart summarizes field reports from users. 22 pages.	Carpenter Co.
Equipment 298C	Pictures, descriptions, specifications charts, dimensional drawings of a line of pumps, motors, transmissions, cylinders and valves for use in the iron, steel, metal working, plastic, automotive, rubber, printing, lumber and textile industries. 12 pages.	Oilgear Co.
Belts 298D	Photographs show details of major parts used in construction of line of conveyor and elevator belts. Covers specifications and functions of each part. Application recommendations and performance for each type of belt. 26 pages.	B. F. Goodrich Co.
Valves 298E	Describes a cross section of this company's line of valves which cover a substantial range of industrial applications. Covers two new valves, an automatic reseating relief valve and a large size pressure reducing and regulating valve. Calls attention to construction changes in older members of the line. 8 pages.	A. W. Cash Valve Mfg. Corp.
Organic Chemicals 298F	Physical and chemical properties, latest specifications, applications, shipping and handling information on a line of synthetic organic chemicals. A water-repellent treatment with aluminum acetate powder is described as well as data on acetic acid, sodium acetate, vinyl acetate, acetaldehyde, acetonitrile and 12 other chemicals. 52 pages.	Niacet Chemicals Division
Dry Blender 298G	Installation photographs and information on the application of the conical blender to dry blending operations. Applications pictured include mixing of dry powders, colors, pigments, minerals, fine and heavy chemicals, photographic chemicals, plastics, medicinals, fertilizers. 12 pages.	Patterson Foundry and Machine Co.
Feeder 298H	Small size, high capacity dry chemical feeder. Illustrations include various component parts, dimension drawings, and five typical installations. 8 pages.	Omega Machine Co.
Joint Sealer 298I	Thread sealing compound, liquid emulsion of elastomers which changes in the joint to a touch elastic solid. Properties and applications. Pocket-sized leaflet. 6 pages.	West Chester Chemical Co.

—End

non-toxic, non-volatile, non-corrosive

gluconic acid

is the choice as an acid catalyst

Non-toxic, non-volatile, non-corrosive gluconic acid is being used with increasing frequency as an acid catalyst for vat soluble ester printing pastes. Formulations made with gluconic acid are more stable than those made with other organic acids, a factor of real importance when breakdowns occur. Moreover, such pastes yield bright, clear colors without tendering of the fabric. In alkaline solutions, gluconic acid offers the additional advantage of efficient sequestering action, giving protection against trace metals which may cause dulling of colors.

Many of the same outstanding characteristics which make gluconic acid so effective as an acid catalyst in printing pastes also apply to its derivative — glucono-delta-lactone, the anhydride of the acid. This white, odorless, free-flowing powder is stable in air and of a high degree of purity. Glucono-delta-lactone is the acid catalyst of choice for acid colloid resins because:

1. Afterwash can be eliminated. 2. It gives better "hand". 3. It is easy to handle in production. 4. Contains no water — reduces shipping, storage and handling.

Write today for samples and prices of both products. Detailed information available in Technical Bulletin #6 and #33.

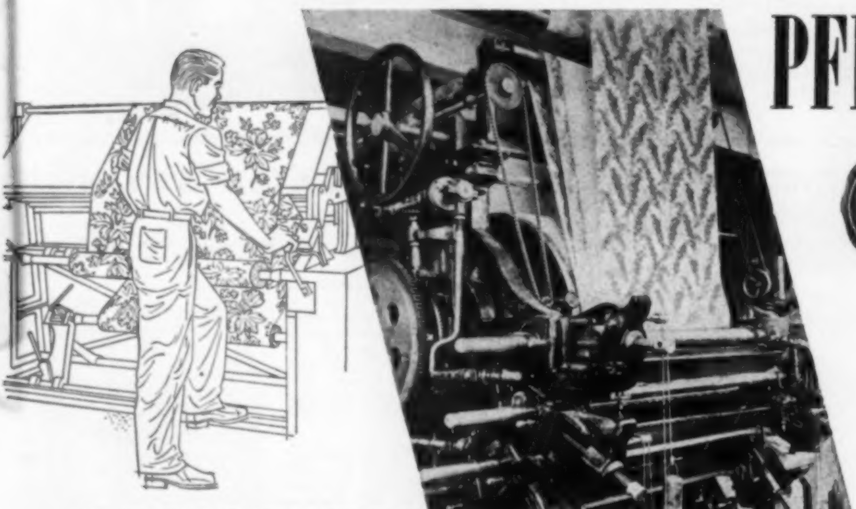


Photo courtesy — D. C. McGiehan — Rice Barton Corporation.

PFIZER

PFIZER QUALITY ®

GLUCONIC ACID

**AMMONIUM GLUCONATE • CALCIUM GLUCONATE • COPPER GLUCONATE • FERROUS GLUCONATE • GLUCONO-DELTA-LACTONE
MAGNESIUM GLUCONATE • MANGANESE GLUCONATE • POTASSIUM GLUCONATE • SODIUM GLUCONATE**

CHAS. PFIZER & CO., INC., 630 Flushing Ave., Brooklyn 6, N. Y. • 425 North Michigan Ave., Chicago 11, Ill. • 605 Third St., San Francisco 7, Calif.

Controls Threaten to Cut Expansion Plans

Controls on the supplies of raw materials will curtail but not stop a sizable part of our chemical expansion this year. With almost every segment of the CPI operating at close to capacity rates, demand is still not satisfied (see page 130). Construction of new facilities to increase the output of our plants is being held back by the serious metal shortages that have developed in the past year. However, the most important problem facing the chemical industry today is the growing scarcity of basic raw materials—even before the arrival of large-scale defense orders.

While more and more defense orders are being issued, they still do not bulk large on production lines. Many of them require substantial "make-ready" time. Long-term industrial planning is almost impossible under present conditions. So, most CPI firms are working on a short term basis, waiting for Washington to make the decisions that will cast their future role in the war effort. Many firms have sent representatives to the interested government agency offering their services as a means of speeding the decisions and aiding the government to understand the problems of the individual chemical and producing firms.

In the first two months of 1951, the control program, (or lack of one) created industrial confusion that will become worse until a definite procedure is established for the allocation of materials and facilities for defense and permissible civilian markets.

Supply & Demand

• Prices climbed again in January. Both *Chemical Engineering* Indexes were up. Oils & fats jumped 9 points while chemicals rose only 1 point as price controls moved in.

• Other controls began to put in their appearance in January. NPA put out orders affecting chlorine, ethyl cellulose, and methylene chloride.

• Shortages of raw materials spread to more chemicals last month. Salt cake has left the buyer's market and is back in balance.

Controlling Chemicals—NPA got down to brass tacks in January. After wrestling with the DO order problem as it hits the chlorine industry, it set up a series of distribution controls that will guide the sale of marketable chlorine into the desired channels. At the same time it placed restrictions on the tonnage that any one producer will have to supply. The order requires each producer to continue filling orders from their 1950 customers who use it to purify water or treat sewage in cases where public health is a factor. Makers and distributors are required to fill DO orders from a customer up to amounts purchased by the customer in 1950. However, the producer is not forced to deliver more than 25 percent of this tonnage in any one month. The order M-31 states that chlorine producers do not have to sell more than 10 percent of their marketable gas to fill defense orders. The order also requires that orders have to be placed with the producer or distributor at least 15 days before the beginning of the month in which delivery is requested. No dealer or distributor has to fill subnormal-sized orders.

Ethyl cellulose was placed under M-32 late in January. Producers of this chemical may be called on to sell up to 40 percent of their monthly output to customers armed with rated orders. Here too the orders have to arrive at least 15 days ahead of the delivery month.

No super-priorities are planned at this time according to NPA spokesmen. The agency is well aware of the breakdown of the priority system early in World War II and does not want its priority system to become a mere hunting license for chemicals. NPA says anyone who can not get DO orders filled should tell them. They will help locate supplies.

Unbalancing Shortages—As an example of the tremendous unbalancing effect that the shortage of sulphur has had on non-acid users Ansul Chemical points out that they could sell about three to four times as much sulphur dioxide as they will be able to produce this year. They point out that since the voluntary cutbacks in the sale of raw sulphur, many companies have been forced to seek other sources of sulphur or sulphur compounds. This has placed a tremendous demand on the liquid SO_2 producers. Unfortunately, firms like Ansul are currently hard pressed to take care of their old customers and firms considering SO_2 use for the first time are having difficulty in getting it. Until sulphur dioxide users can convert to pyrites burning or other processes, demand will considerably exceed supply.

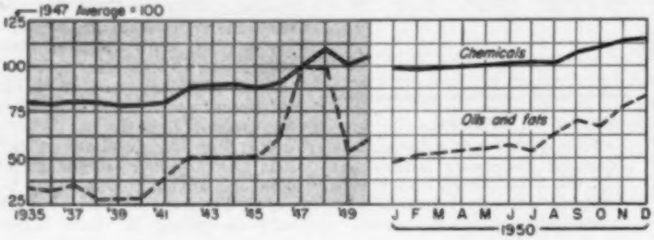
Shortages in organics are not confined to the big-volume alcohols. Methyl chloride producers are operating at capacity rates and still will not produce enough for the synthetic rubber and silicone markets. By the end of the year, these two industries will want about twice as much as all producers can make. Methyl chloride is extremely limited by plant facilities. Until present plants are expanded or new plants are built, production can not be pushed much higher. With adequate plant capacities, producers of this chemical then will be faced with the shortages of raw materials.

Chemical Market Report—Foster D. Snell, Inc., New York, has just begun the third year of publication of the Chemical Market Report. It has just been enlarged so now about 2,000 abstracts of market information relating to chemicals and chemical products appear each month in this informative abstracting series. These are drawn from the scientific and trade journals, house publications, and government sources. Subject matter includes any information published during the abstracting month concerning production, producers, consumers, use, and foreign trade. It covers both foreign and domestic data.

The information is organized in book form with three sections. They are: (1) chemical producers, (2) chemical consuming industries, and (3) specific chemicals. Four indexes—actually abstracts of the abstracts—are included. They classify the contents by trade mark, company, use, and foreign country. The alphabetical arrangement of the chemical section makes this portion self indexing. Price is \$15 per month. Half price for additional subscriptions from the same firm.

Process Industry Trends

PRICES

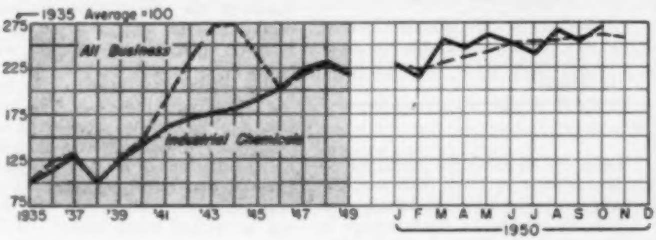


Chemical Engineering's Price Index

Chemicals Up— 1.02
Oils & Fats Up— 9.01

	Chemicals	Oils & Fats
As of February 1.	118.98	97.69
Last month	117.96	88.68
February 1950	98.94	51.21
February 1949 ...	104.19	65.48

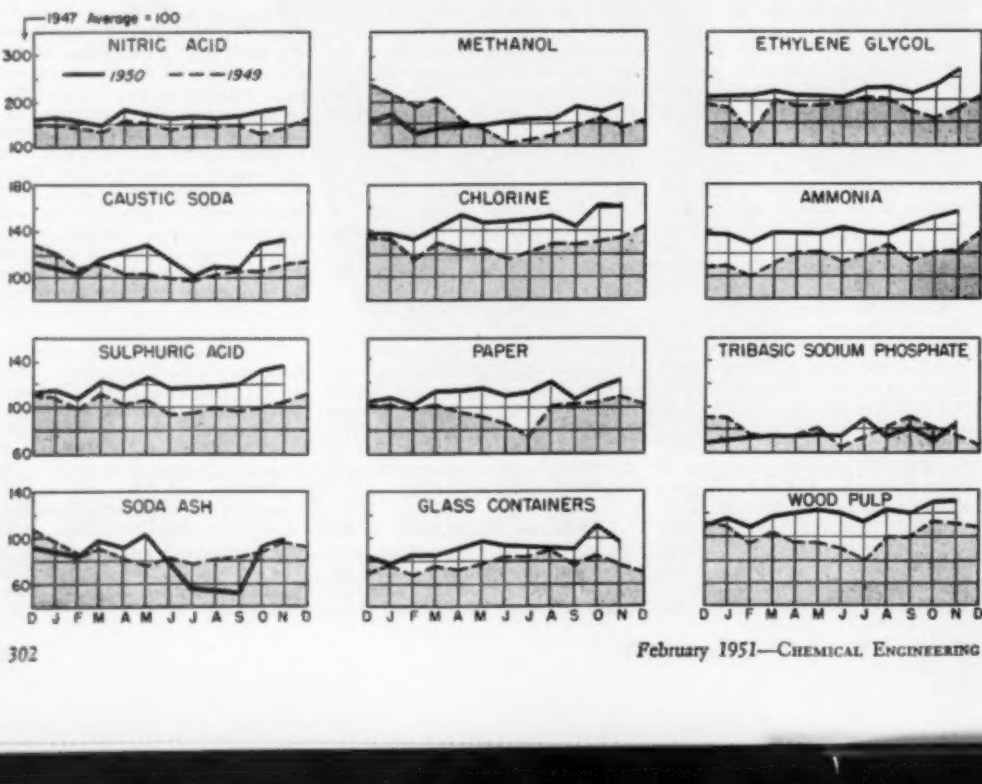
CONSUMPTION

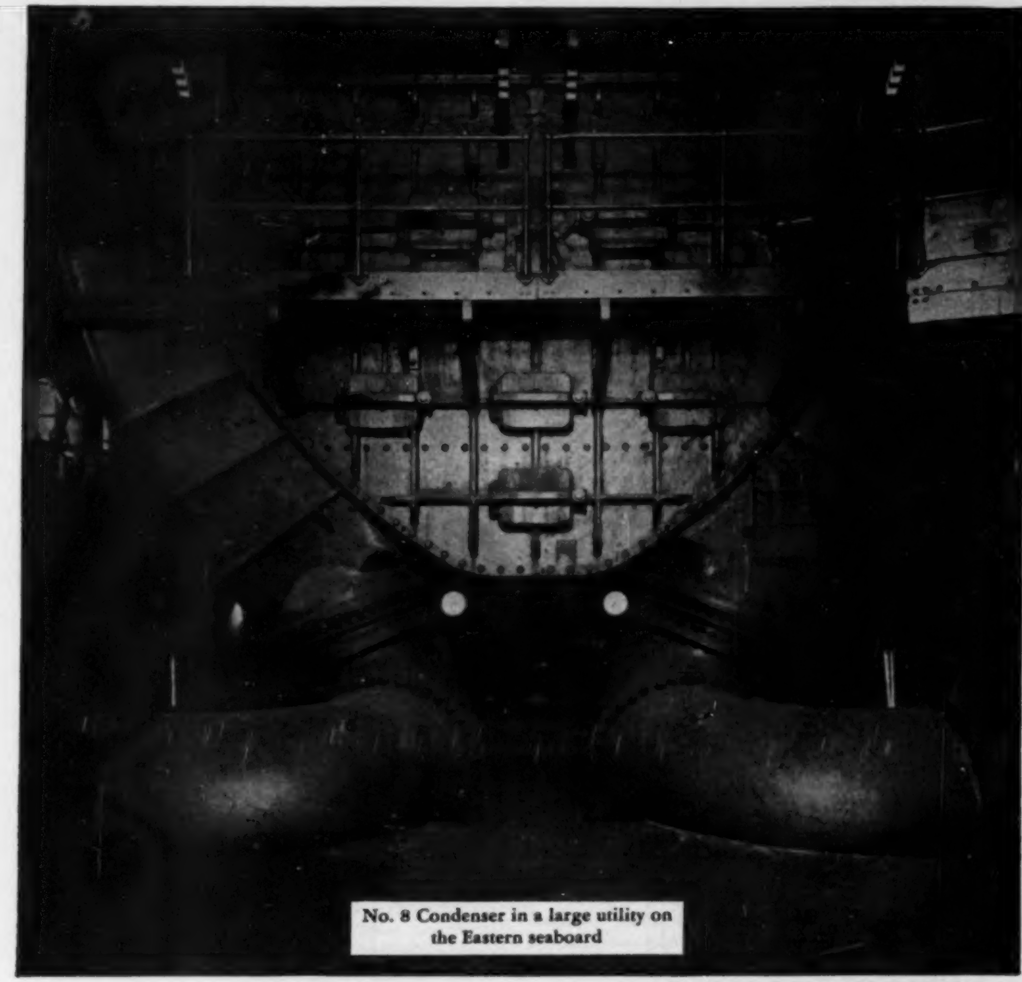


Industrial Chemical Index

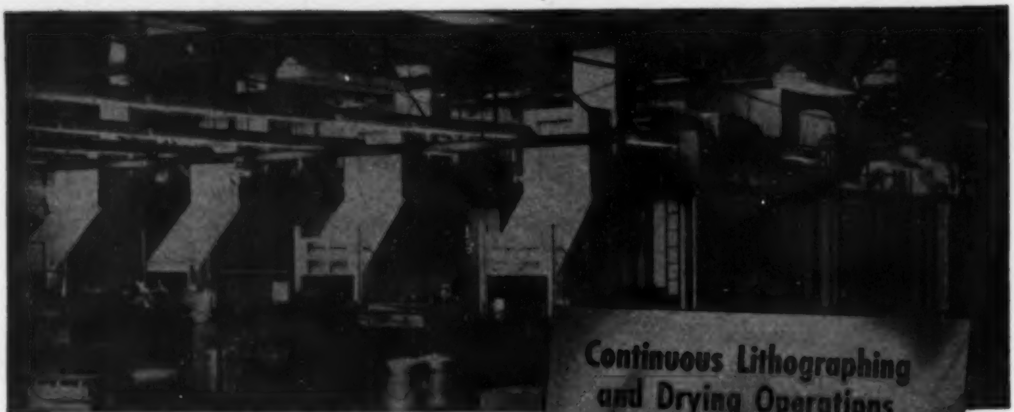
	October	November
Fertilizers	56.81	56.70
Pulp and paper	29.01	28.85
Petroleum refining..	24.48	23.45
Glass	24.01	22.25
Paint and varnish..	27.72	24.20
Iron and steel.......	16.51	14.70
Rayon	31.51	30.20
Textiles	11.77	12.38
Coal products	11.08	10.30
Leather	5.02	4.57
Explosives	9.49	8.73
Rubber	7.13	6.01
Plastics	18.34	17.41
INDEX	272.88	259.75

PRODUCTION





No. 8 Condenser in a large utility on the Eastern seaboard



Four of the battery of Gas heated coating and litho drying ovens at American Can Company. Easily accessible, automatic temperature controls actuate the units, and the circulating fans mounted on top of 105-ft. ovens. The ovens utilize the latest principles of forced convection heating.

Continuous Lithographing and Drying Operations at AMERICAN CAN COMPANY

SHOW HOW GAS KEEPS PRODUCTION RATES FROM LAGGING

PRODUCTION BOTTLENECKS in making metal containers have been overcome by reducing the time required for coatings and printing inks to dry. Inside coating prevents chemical action between can and contents, outside printing identifies it. Since the consumption runs into several hundred million cans per year, rapid automatic production machinery is required, and drying operations must keep pace with it.

Efficient and flexible GAS has done just this at the new St. Louis, Mo., plant of American Can Company. Here, Gas-fired convection ovens gear the drying cycle to the production speed of lithographing and coating lines. Heaters in these drying ovens are direct Gas-fired external type, supplied with inspirator cluster burners, accurately and automatically controllable to meet requirements of the process. The litho drying ovens have three heat zones—two at 300-325° F. for drying—and a third for preheating the conveyor. Coating ovens have three drying zones, automatically regulated to temperatures of 300° to 420° F., and a conveyor heating zone, but are otherwise like the litho ovens.

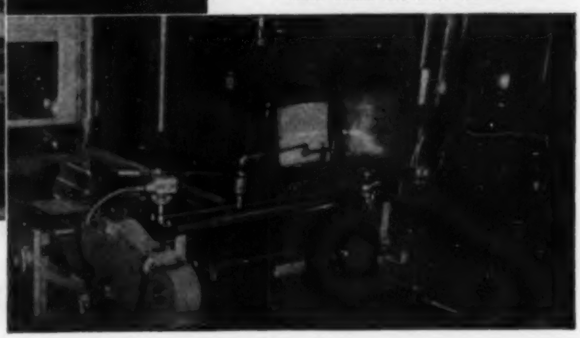
After the flat sheets are printed, coated and dried, they are cut into blanks for forming. GAS melts the solder used to close the longitudinal seams, and as the cans move along the conveyor, a series of small GAS flame jets play on the seam to effect a satisfactory seal.

By stepping up the drying cycle in metal container manufacturing, GAS fulfills another of its major productioneering roles. It's this effective use of flexible, precisely-controlled Gas Equipment which overcomes so many heat-processing slowdowns. Your Gas Company Representative will show you how it can be done.

MORE AND MORE... THE TREND IS TO GAS

AMERICAN GAS ASSOCIATION
420 LEXINGTON AVENUE
NEW YORK 17, NEW YORK

Steel sheets are fed through the tandem printing presses (foreground) and then into the litho drying ovens.



After lithographing, the plates are varnished in this press, and conveyed to the litho oven.

Commodity Survey **Edited by Richard F. Warren**

Xylene

Benzene's higher prices may open big new markets for this versatile chemical.

Xylene is a valuable co-product of benzene and toluene operations. Tonnage-wise, it is not as big a chemical. However, it is destined to play a bigger role in our future economy. Today most of it is used in high octane gasoline. But a growing quantity is finding its way into the chemical industry, where it is used in the production of dyestuffs, medicinals and phthalic anhydride.

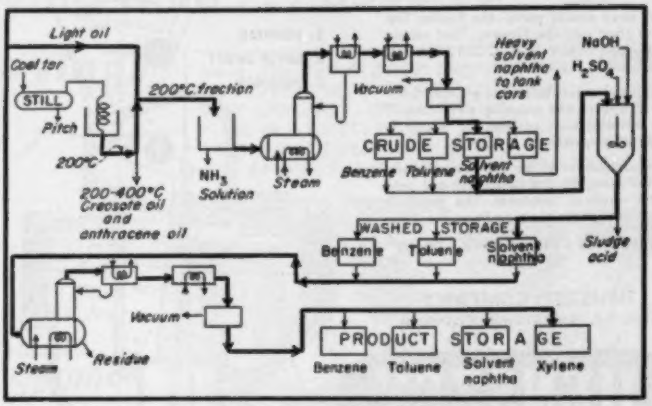
To understand how this chemical fits into the nation's economy, it is necessary to see how it is produced. Until the start of World War II supplies of xylene came from byproduct light oil operations. In the coal-tar industry the light oil fraction that boils under 200 deg. C. is the starting point in isolating xylene. This fraction (containing 4-7 percent xylene) is fed to a stream still after ammonia is removed as an aqueous solution and separated into crude benzene, toluene, light solvent naphtha, and heavy solvent naphtha fractions. The light solvent naphtha fraction is washed with sulphuric acid (to remove the unsaturated hydrocarbons). Then it is neutralized with caustic soda. Washed solvent naphtha is then further distilled to yield industrial grade xylene. This product usually has the following composition:

Component	Percent
o-Xylene	18–23
m-Xylene	50
p-Xylene	20–23
Ethyl benzene	4–10

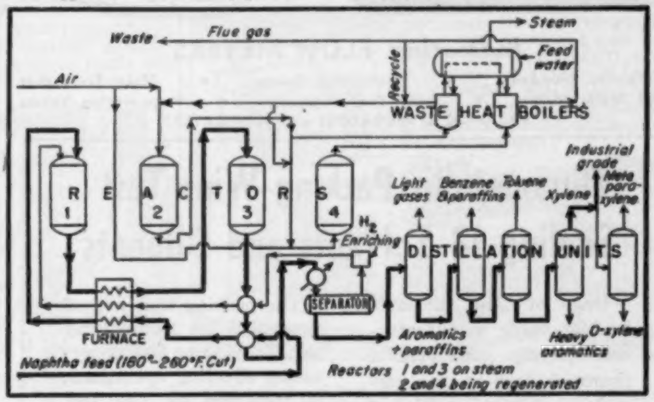
There are also more refined grades of xylene on the market. Closer fractionation results in what are called 10° xylene, 5° xylene and nitration grade xylene. These designations refer to the distillation range of each product. Industrial grade xylene is the product that completely distills below 160 deg. C., with 90 percent distilling below 150 deg. C.

During and since World War II, most of our xylene has come from petroleum refineries. This is due to the tremendous demand made on the petroleum industry by the war effort.

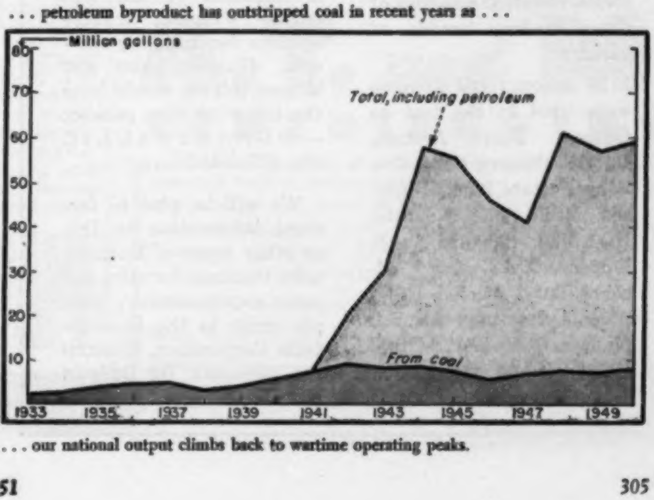
(Continued)



Coal byproducts were formerly prime source of supply, but . . .



. . . petroleum byproduct has outstripped coal in recent years as . . .



. . . our national output climbs back to wartime operating peaks.

Demand for high-octane fuel and toluene resulted in the construction of eight Hydroformers. These were used to make large quantities of aromatic blending stock for gasoline and toluene for TNT. This resulted in a huge output of xylene.

Here is the way Hydroformers produce xylene. The naphthene feed cut is usually taken in the range of about 180-260 deg. F. to give maximum yields of xylene. (If benzene or toluene are the desired products, the range of the cut will vary from these figures.)

The feed stock (containing a mixture of cyclic and acyclic hydrocarbons) is passed through heat exchangers into a furnace. From here it moves to the first of two reactors. In the reactors dehydrogenation and cyclization is promoted by molybdenum oxide-on-alumina catalysts at 150 to 300 psig. and 900 to 1,000 deg. F. with a high H_2 concentration in the reactor. From the reactor it returns to the furnace and moves on to the second pass reactor. The product of the second reactor goes through a series of heat exchangers to a gas separator. Here some of the product is recycled. The remaining hydroformate passes to a series of distillation columns where benzene and toluene are removed. Next xylene is separated from the heavier aromatics. Some is sold as industrial grade xylene. However, some firms further refine it and at least one petroleum producer (Standard of California) carries the separation a step further by isolating ortho xylene for use in production of phthalic anhydride. The para isomer is also separated for use in production of terephthalic acid—one of the raw materials for Du Pont's Fiber V. This market will soon jump to about 50,000,000 lb. per year.

Nevertheless, both meta and para isomers are excellent blending agents in aviation grade gasoline. Ortho xylene is not desirable in high test fuels. Separation of this isomer may become more prevalent in the wartime future as aviation gasoline specifications are now much higher than they were at the peak of World War II.

Here is the use pattern that developed during the last world conflict.

Use	Percent
Gasoline blends	73.5
Protective coatings	20.0
Medicinals	1.5
Other	5.0
	100.0

Actually this pattern is somewhat misleading because about 50 percent

(Continued)


High speed centrifuging cut crystal drying time . . . boosted savings
ANOTHER A.T.&M. SUCCESS STORY BY Sam Spinner
SAM, I'M USING BOTH CENTRIFUGING AND OVEN HEAT TO DRY CHEMICAL SALT CRYSTALS. OVEN DRYING TIME IS A BOTTLENECK THAT'S COSTING ME PLENTY – CAN YOU SPEED THINGS UP?
HMM... I THINK A NEW SET-UP WOULD SAVE YOU REAL MONEY HERE.
I'VE INSTALLED THIS NEW, HIGH-SPEED CENTRIFUGAL. ITS FASTER BASKET SPEED REMOVES MORE OF THE MOISTURE FROM THE CRYSTALS, LEAVING VERY LITTLE FOR THE OVEN TO DO.
JUST LOAD THE CENTRIFUGAL, SPRAY THE CRYSTALS AND SPIN DRY. BUT THE OVEN'S JOB IS NOW SO SMALL IT CAN'T POSSIBLY HOLD UP THE JOB. YOU SHOULD MAKE REAL SAVINGS WITH THIS EQUIPMENT.


LATER
THIS WORKS FINE, SAM. THE NEW CENTRIFUGAL REDUCES CRYSTAL MOISTURE TO 1%. BEST THE OLD ONE COULD DO WAS 6%. THE OVEN CAN'T SLOW US UP NOW – I FIGURE WE'LL SAVE $30,000 THIS YEAR ALONE.
COST-AND TIME-SAVING'S OUR BUSINESS AT A.T.&M. THAT'S WHY HIGH SPEED CENTRIFUGING IS TAKING OVER MORE CHEMICAL JOBS ...IT DOES 'EM FASTER BETTER, AT LESS COST.

of the xylene produced is not isolated and reported as such. This part of the nation's output goes directly into gasoline as part of the aromatic blending stock. With the price of critically-short benzene climbing more than 50 percent in the past year, xylene is being seriously considered as a substitute in plastic operations. Another use with a large potential market is production of isophthalic acid. This acid is more reactive than terephthalic and has a broad potential as a replacement for phthalic anhydride in alkyds, fibers and adhesives. Isophthalic acid will be available in the future at industrial grade xylene prices.

This expanding chemical market may encourage use of the newer platforming process in output of xylene, as well as wider recovery of xylene from virgin crude via azeotropic distillation methods. Prime reason for a lack of interest in this field is the high capital investment compared with the present limited market.

Price of xylene has not climbed much over the last 12 years. In 1939 it was selling for 26-27c. per gal. In 1947 the same industrial grade was selling for 25-30c. per gal. The price range last year was up to 23-35c. per gal. Today the price range stands at 25-35c. per gal. With this price structure it has become more competitive with benzene.

Producers of xylene, include a host of byproduct coke operators and other firms who cut out xylene from light oil fractions. All the major steel firms such as U. S. Steel (with eight producing points), Republic Steel (with nine plants), Bethlehem Steel (with four plants), Inland Steel, Jones & Laughlin, and Wheeling Steel produce it. Barrett division of Allied Chemical & Dye Corp. produces it at Philadelphia. Koppers Co. is another producer. Others include firms like Pittsburgh Coke and Chemical, Neville Co., Donner-Hanna, Calco Division of American Cyanamid, Colorado Fuel & Iron, and Portland Gas & Coke Co. These are only a few of the firms engaged in production of xylene from coal sources. Listed below are major petroleum firms in a position to supply it with hydroformers or similar units.

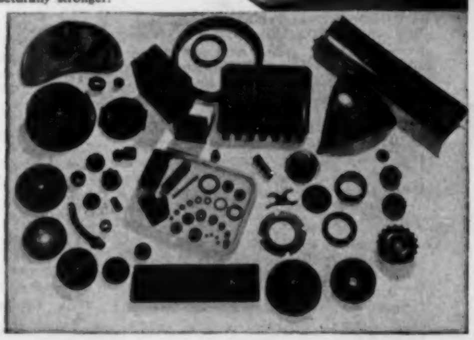
Hydroformers Help

Petroleum Xylene Producer	Location
Continental Oil Co.	Ponca City, Okla.
Humble Oil Co.	Baytown, Tex.
Pan American Ref. Co	Texas City, Tex.
Pure Oil Co.	Toledo, Ohio
Shell Oil Co.	Wilmington, Calif.
	Wood River, Ill.
Standard Oil of Ind.	Whiting, Ind.
Standard Oil of Calif.	Richmond, Calif.
Texas Co.	Lockport, Ill.
Union Oil Co. of Calif.	Oleum, Calif.

—*End*

What's U. S. Rubber doing to bridge the gap between hard and soft rubber?

Washing machine parts, formerly made of plastic and metal, now made of new thermosetting plastic, Enrup, which has higher abrasion resistance and is structurally stronger.

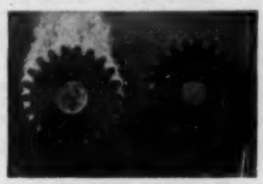


Some of the products made of Enrup for leading manufacturers. The smallest items weigh as little as one-third of an ounce. Engineers often find Enrup cuts molding costs, permits operating economies hitherto impossible.

The new "U. S." thermosetting plastic, Enrup, can be made flexible and elastic as soft rubber, or rigid as hard rubber. Enrup offers entirely new possibilities to design engineers. The washing machine parts, shown above, are made of Enrup because its abrasion resistance and structural strength are greater than the combination of metal and plastic formerly used.

Enrup can be made into almost any shape or form, simple or complex. It can be punched, sanded, sawed, nailed, bolted, molded and machined. Perhaps Enrup is just what you've been looking for to improve your product or your manufacturing operation.

For more details, write to address below.



Note how a bath of 20 percent solution of sulphuric acid eats away the steel gear at left, while the Enrup gear is unharmed. Enrup is non-conductive, non-absorbent, easy to clean, is noiseless.

PRODUCT OF

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

New Construction

	Current Projects — Proposed Work	Current Projects — Contracts	Cumulative 1951 — Proposed Work	Cumulative 1951 — Contracts
New England	....	....	....	$90,000
Middle Atlantic	....	$3,375,000	....	2,409,000
South	$6,800,000	2,300,000	$17,800,000	12,844,000
Middle West	2,500,000	7,797,000	17,500,000	6,122,000
West of Mississippi	74,500,000	4,335,000	87,500,000	10,859,000
Far West	....	2,082,000	2,250,000	3,581,000
Canada	....	18,000,000	....	20,000,000
Total	$83,800,000	$37,889,000	$125,050,000	$56,915,000

Proposed Work

Ill., Bedford Park—Mid-States Gummed Paper Co., Div. of Minnesota Mining & Manufacturing Co., Harlem Ave., has acquired a 114 acre site here and plans to construct a plant. Estimated cost $4,000,000

Kan., Neodesha—Standard Oil Co. (Indiana), Neodesha, plans to construct a 9,000 bbl. capacity refinery expansion. Estimated cost $2,500,000

N. C., Roanoke Rapids—Albemarle Paper Manufacturing Co., Tredegar St., Richmond, Va., plans to construct a plant here. Estimated cost $6,800,000

Tex., Beaumont—Kaiser Aluminum Co., Baton Rouge, La., plans to construct plant here to process aluminum from Baton Rouge plant. Estimated cost $70,000,000

Tex., Orange—E. I. du Pont de Nemours & Co., Inc., Orange, plans to double the capacity of its polythene plant here. Estimated cost $4,500,000

Contracts Awarded

Calif., Vernon—General Petroleum Corp., 612 South Flower St., Los Angeles, has awarded the contract for a 1 story laboratory building to P. J. Walker Co., 555 South Flower St. Estimated cost $82,000

Del., Newark—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, will construct four 1 story brick buildings for nutrition, biology and animal research to be known as Stine Laboratory. Work will be done by owner. Estimated cost $2,700,000

Fla., Bartow—Armour Fertilizer Works, Hurt Bldg., Atlanta, Ga., has awarded the contract for design and construction of an addition to its fertilizer plant to Rust Engineering Co., Exchange Bldg., Birmingham, Ala. Estimated cost $500,000

Fla., Jacksonville—Glidden Naval Stores Div. of Glidden Co., Berea and Madison Sts., Cleveland, O., will construct additional buildings and facilities at Jacksonville-Norwood plant for processing pine products. Work will be done by owner. Estimated cost $200,000

Ga., East Point—Pittsburgh Plate Glass Co., c/o Robert & Co. Associates, Archts., 96 Poplar St., N. W., Atlanta, has awarded the contract for a paint and varnish manufacturing plant to Ira H. Hardin Co., Zahner Bldg., Atlanta. Estimated cost will exceed $1,000,000

Ill., Chicago—Bag Kraft Corp., 45th and Kildare Sts., has awarded the contract for a plant for the manufacture of printed cellophane bags to Welso Construction Co., 2345 South Pulaski Rd., Chicago. Estimated cost $160,000

Ill., Chicago—Glidden Co., Berea and Madison Sts., Cleveland, O., has awarded the contract for enlarging its soy bean plant to Adache & Case Engineering Co., 3614 Euclid Ave., Cleveland. Estimated cost $525,000

Ill., Chicago—Glidden Co., 1815 North Laramie St., has awarded the contract for an auxilary factory building for soy bean refining to Enger Bros., 4910 St. Paul St. Estimated cost $275,000

Ill., Chicago—Stepan Chemical Co., 1353 North Branch St., has awarded the contract for an addition to its factory to Schillmoeller & Kroft Co., 3459 Lincoln St. Estimated cost $150,000

Ill., Chicago—United Drug Co., 2305 West Pershing St., has awarded the contract for a 3 story warehouse addition to Poirot Construction Co., 2001 West Pershing St. Estimated cost $500,000

Ill., Skokie—International Minerals & Chemical Co., 20 North Wacker Dr., Chicago, has awarded the contract for a research laboratory to H. K. Ferguson Co., 120 South LaSalle St., Chicago. Estimated cost $400,000

Ill., Stickney Twp. (Chicago P. O.)—Nox-Rust Chemical Co., 48th and Central Sts., Chicago, has awarded the contract for a factory for the manufacture of cleaning compounds to B. W. Handler Construction Co., 223 West Jackson St., Chicago. Estimated cost $82,000

Ind., Milan—Jos. Seagram & Sons, Lawrenceburg, has awarded the contract for three whiskey warehouses to F. W. Owens Co., 118 North 5th St., Louisville, Ky. Estimated cost $1,000,000

Ky., Louisville—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., will construct an addition to its neoprene plant here. Work will be done with own forces. Estimated cost $500,000

La., Weeks—Bay Chemical Co., Div. of Morton Salt Co., 1048 Constance St., New Orleans, has awarded the contract for design and construction of a salt plant to Rust Engineering Co., 575 Sixth Ave., Pittsburgh, Pa. Estimated cost will exceed $100,000

Mich., Detroit—Michigan Chrome & Chemical Co., 6340 East Jefferson St., has awarded the contract for a plant and warehouse to Cunningham-Limp Co., 3087 West Grand Blvd. Estimated cost $105,000

Mo., St. Louis—Asbestone Corp., 5372 Tchouptulas St., New Orleans, La., has awarded the contract for an asbestos shingle plant to Commercial Construction Co., 1610 Hampton Ave., St. Louis. Estimated cost $750,000

O., Dayton—Dayton Rubber Co., 2342 West Riverview St., has awarded the contract for a factory and warehouse addition to R. G. Hastings Construction Co., Rosedale Dr. Estimated cost $436,000

O., Painesville—Diamond Magnesium Co., Painesville, has awarded the contract for rehabilitating its factory to H. K. Ferguson Co., 1783 East 11th St., Cleveland

Pa., Butler—Air Reduction Sales Co., Div. of Air Reduction, Inc., 60 East 42nd St., New York, N. Y., has awarded the contract for design and construction of a plant for the manufacture of oxygen and nitrogen to Koppers Co., Inc., Koppers Bldg., Pittsburgh. Estimated cost $500,000

Pa., Franklin (Cambria P. O.)—Air Reduction Sales Co., Johnstown, Pa., has awarded the contract for an oxygen factory to Berkibile Bros., 625 Swank Bldg., Johnstown. Estimated cost $85,000

Pa., Oil City—Wolf's Head Oil Refining Co., Oil City, has awarded the contract for a warehouse addition to L. O. Boquin Co., 13 East 1st St., Oil City. Estimated cost $90,000

S. C., Anderson—Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, O., has awarded the contract for a fiberglas yarn manufacturing plant to Daniel Construction Co., 429 N. Main St., Greenville. Estimated cost $3,000,000

S. C. Hanahan—United Piece Dye Works, Nicholson St., Lodi, N. J., has awarded the contract for a finishing, dyeing and printing plant near here to C. M. Guest & Son, Anderson, S. C. Estimated cost $1,000,000

Tex., Goliad—Flint Ink Co. and Howard Flint Chemical Co., 403 Somerset St., San Antonio, will construct an ink plant. Work will be done by owners. Estimated cost $100,000

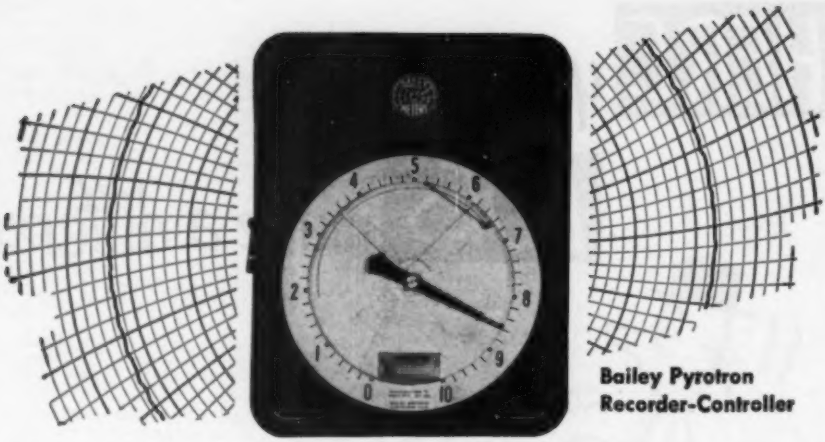
Tex., Shamrock—United Carbon Co., Charleston, W. Va., has awarded the contract for a carbon black plant to Ted Farris Construction Co., 116 South Walker St., Oklahoma City, Okla. Estimated cost $975,000

Tex., Sweetwater—Lone Star Cement Corp., 1st Natl. Bank Bldg., Dallas, has awarded the contract for 15 storage silos and 8 raw-mix silos also storage building to Walsh Construction Co. and Gifford Hill Co., Inc., Natl. Bank Bldg., Dallas. Estimated cost $1,310,000, $710,000 and $490,000 respectively.

Wash., Vancouver—Electro-Chemical Co., Buffalo, N. Y., has awarded the contract for a hydrogen peroxide plant on 44 acres of Vancouver shipyard site to Geo. H. Buckler, 4235 S. E. 17th St., Portland, Ore. Estimated cost $2,000,000

Wis., Port Edwards—Nikoosa-Edwards Paper Co., Port Edwards, has awarded the contract for a 50,000 sq. ft. paper storage warehouse to Edward H. Meyer Construction Co., P. O. Box 705, Neenah.

Ont., Sarnia—Canadian Oil Companies, Ltd., 204 Richmond St., Toronto, has awarded the contract for design and construction of oil refinery to produce gasoline and ingredients for synthetic rubber at Broomfield to Canadian Kellogg Co., Ltd., 34 Adelaide St., W. Toronto. Estimated cost $18,000,000



Bailey Pyrotron Recorder-Controller

Looking for Better Temperature Instruments?

...Then check these features of Pyrotron Electronic Resistance Thermometers...

FUNDAMENTAL ACCURACY

Bailey Pyrotron Resistance Elements are made of highest purity platinum—the material used by the National Bureau of Standards in establishing basic standards for temperatures from -190°C to $+660^\circ$C.

THREE TYPES OF CONTROL

Pyrotron Controllers may operate: on-off electrical systems by either electronic relays or electric contacts, modulated electronic systems, or air-operated systems. Two temperatures may be recorded on the same chart and controlled by a single instrument.

FACTS PUT INTO USABLE FORM

Bailey Pyrotrons may be arranged to put temperature facts into convenient usable forms. If two or more temperatures are related, they may be recorded as continuous records on the same chart for easy comparison. The average of several temperatures or the difference between two temperatures may be recorded as a single continuous record which may be retransmitted to a distant point or used to actuate a control system.

EASY INSTALLATION

Bailey Pyrotrons do not require careful leveling or protection against vibration. Three ordinary copper wires are all that is needed to connect each temperature sensitive element with the recorder. Power may be taken from any 115 volt 60 cycle circuit.

MINIMUM MAINTENANCE

The absence of galvanometers, batteries and standardizing equipment, together with the use of interchangeable unit assemblies, reduces Pyrotron maintenance to the vanishing point.

ABUNDANT POWER

A separate motor drive for each temperature furnishes abundant power to operate a recording pen, a controller and an alarm switch.

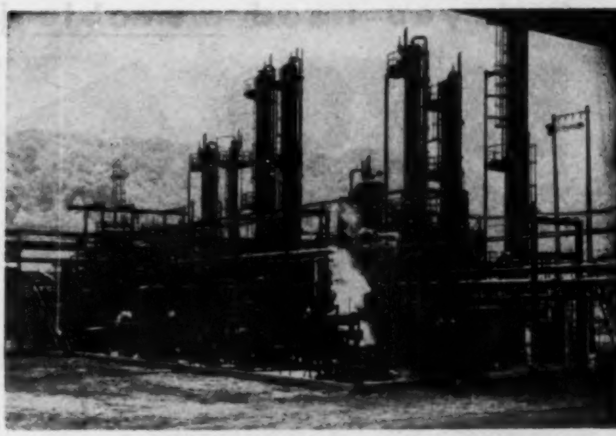
For the full story on this unusual electronic resistance thermometer which is suitable for ranges between —300°F and 1200°F, ask for Bulletin No. 230-C. P-21

BAILEY METER COMPANY

1054 IVANHOE ROAD • • • CLEVELAND 10, OHIO

Controls for Processing

TEMPERATURE
PRESSURE
% OXYGEN
% COMBUSTION
FLOW
LEVEL
DENSITY
RATIO



Pictured above is a Pritchard designed plant recently completed for the separation of quality grade monochlor and dichlor benzene from crude chlorinated benzenes.

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Depend on
Pritchard Designed Plants

Superiority of product . . . maximum plant efficiency and ease of operation...longer periods of "on stream" operation with freedom from maintenance troubles—these are the things for which Pritchard chemical plants are becoming known and talked about throughout the industry today.

Pritchard's services are *flexible.* For those who desire complete "turnkey" service to include everything from analysis of requirements to final operating tests, Pritchard offers its *single responsibility contracts.* For those who desire to supplement the work of their own permanent engineering staff and relieve them of the extra work load of new plant design, engineering, procurement or construction, Pritchard stands ready to assist them as the project may require.

You are invited to make use of Pritchard's diversified experience in the chemical field to make your next plant construction, modernization or extension outstanding in the industry.

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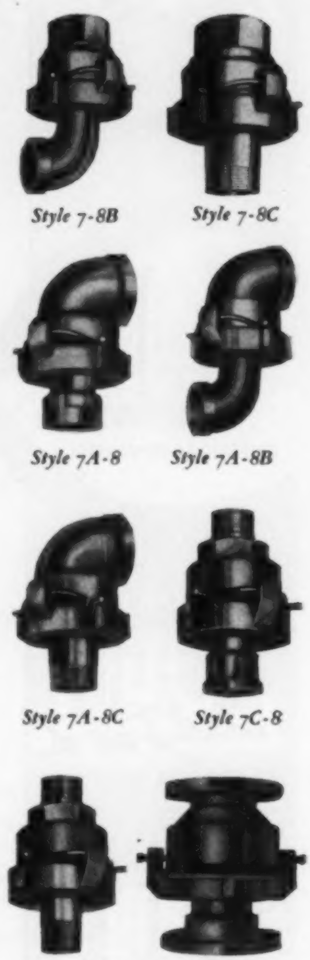
—when you need movable joints in piping

BARCO

Style 7-8

FLEXIBLE BALL JOINTS



Style 7-8B · *Style 7-8C* · *Style 7A-8* · *Style 7A-8B* · *Style 7A-8C* · *Style 7C-8* · *Style 7C-8C* · *Style 7F-8F*

—many other styles available.

Versatile!

THE BARCO Flexible Ball Joint is one of the most useful, most versatile fittings ever developed for application on piping conveying steam, oil, gas, water, air, chemicals, refrigerants, or other fluids. Find out how these simple, rugged, economical joints can help you:

- **Provide for movement in piping—up to 40° side flexibility in any direction, plus 360° rotating movement!**
- **Protect piping against strain, stress, settling, shock, or vibration!**
- **Overcome piping misalignment!**
- **Provide insulation barriers to stop electrical currents causing electrolysis in piping. Also used to prevent leakage of current from plating tanks.**

FIRE-PROOF! PRESSURE SAFE! No side thrust developed by pressure in piping even if one end is suddenly loosened. No danger of whipping! Available in materials suitable for temperatures from -50° to as high as 1,000° F.; for pressures from vacuum to 750 p.s.i. steam, or 6,000 p.s.i. hydraulic.

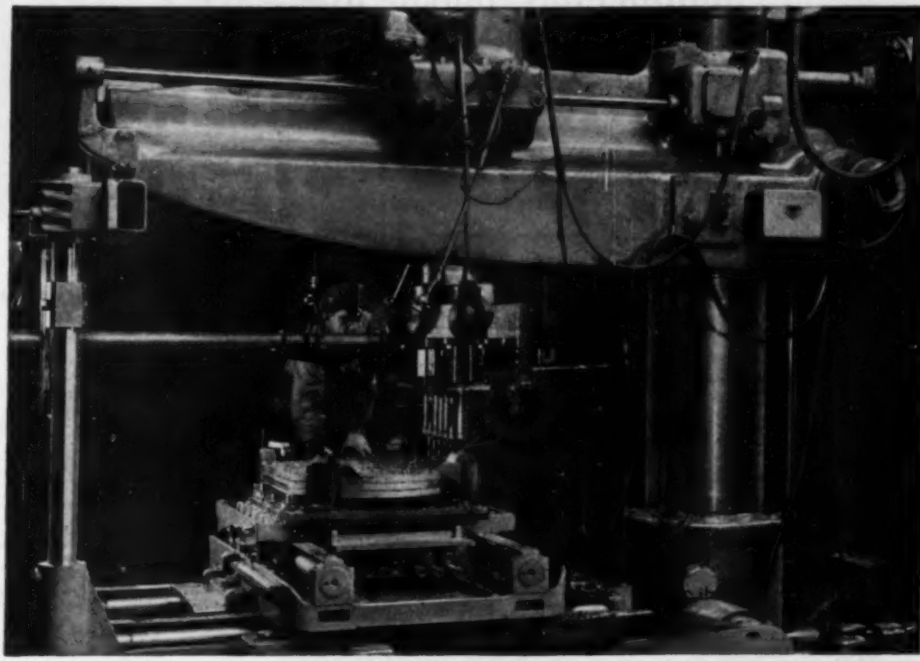
COMPLETE LINE— 15 different sizes, ¼" to 12". Angle or straight, male or female threaded connections—flanged connections—welding ends for welded connections. Choice of seven different gasket materials to meet various service requirements, including "TEFLON" gaskets with stainless steel bodies for handling corrosive liquids or gases. Also magnesium bodies for light weight in large sizes. In ordering, specify service. *Write for latest, illustrated literature.* BARCO MANUFACTURING CO., 1816-C Winnemac Ave., Chicago 40, Ill. In Canada: The Holden Co., Ltd., Montreal.

BARCO

THE ONLY TRULY COMPLETE LINE OF FLEXIBLE, SWIVEL, SWING AND REVOLVING JOINTS

Worldwide Sales and Service

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY



Typical of the special production facilities available for the manufacture of any type of heat exchanger is this Multiple Spindrel Drill with automatic tube hole spacer. Designed for accurate spacing and drilling of tube holes in tube sheets, baffles and support plates.

Close-up on Precision in Heat Exchanger Manufacture

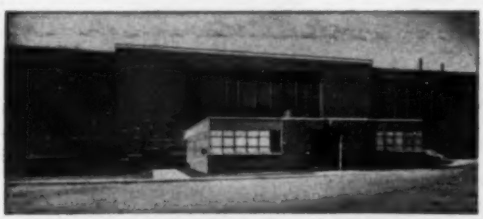
In this Multiple Spindrel Drill, you're looking at one good example of precision and specialization at work—in A. O. Smith's modern Heat Exchanger Plant at Milwaukee.

Of course, the most advanced machine tools and other mechanical equipment are merely the *tangible* reasons why more and more industries are turning to A. O. Smith for the solution of their heat exchanger problems.

Intangible reasons are equally important. When you put your heat exchanger problem up to A. O. Smith, it goes to a "task force" that has a long record of finding the *right* answer. All down the line, you get the benefit of long years of specialized experience in heat exchanger design, construction and assembly. Top engineering and production skill—know-how in heat exchanger engineering and metallurgy. Supervisors and mechanics who *know* their business.

Add to that the well-known A. O. Smith mastery of welding and metal fabrication and you'll see why it will pay to consult A. O. Smith on your next heat exchanger problem!

77th



A.O.Smith's huge modern plant, devoted to the building of heat exchangers.

A.O.Smith

HEAT EXCHANGERS

Atlanta 3 • Boston 16 • Chicago 4 • Cleveland 15 • Dallas 2
Houston 2 • Los Angeles 12 • New York 17 • Philadelphia 3
Phoenix 2 • Pittsburgh 19 • Salt Lake City 1 • San Diego 1
Seattle 1 • Tulsa 3 • Washington 6, D.C.
International Division: Milwaukee 1

BRIDGEPORT BRASS COMPANY

CONDENSER AND HEAT EXCHANGER TUBE EDITION

COPPER ALLOY BULLETIN

"Bridgeport" MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

Open-type pre-heater used in laundry. Both the wash and rinse water flows into the tank by gravity. Fresh water flows in the opposite direction through the copper tubes and into the storage heater where this preheated water is raised to the temperature needed for the wash. Courtesy Whitlock Manufacturing Co., Hartford, Conn.

Recovery of Waste Heat Means Savings in Fuel Costs

Every gallon of hot waste water pouring down the drain represents a loss of fuel or energy.

Where the temperature differential is great, recovery is easy with present-day heat exchangers. However, when the difference is small, the problem of recovery is very great and remains to be economically solved.

Take for example a laundry: for every 10 gallons of 160-degree wash water pouring into the sewer, about one pound of coal or ¾ of a pint of fuel oil was needed to obtain such a temperature. Plants running a large volume of water each month can show sizable savings through the use of waste heat reclaimers—heat exchangers. Not only can heat be recovered from the wash water, in this case, but also from the rinse.

Flash Steam Utilized

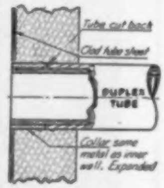
Another interesting example of how engineers have recovered heat to effect large savings is seen in a paper mill digester. Since this operation is done at high temperatures in sealed units under pressure, flash steam is released when the unit is opened after completion of the process. This steam is passed through a tube and shell exchanger and the transferred heat is used to preheat fresh water.

Other industries now utilizing waste heat in processes or from waste water include: textile mills, power plants, refineries, and chemical processing. Some concerns have also used the heat from diesel engine exhaust to preheat water or to heat a plant. Mills have utilized the hot water produced in quenching tanks for heating.

Duplex Tubes Used

Coils in open-type exchangers, and tubes in the closed type, are either of copper or a copper-base alloy depending on the waste media involved. In many cases, Duplex tubes are required when two different corrosive liquids are involved. Combinations of Admiralty, aluminum brass, copper, cupro nickel, aluminum bronze, Muntz metal, yellow brass, Naval brass, silicon bronzes, aluminum, lead, nickel, low carbon steel, stainless steel, alloy steels and tin are possible in Duplex tubes.

Duplex Tube Collars Supplied by Bridgeport

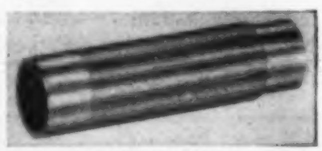


Collar of the same composition as the inside of the Duplex tube, and similar to the tube sheet, is shown assembled in tube sheet to prevent galvanic corrosion.

One of the most serious objections raised by prospective users of Duplex tubes is the possibility of galvanic corrosion. The seriousness of this condition varies with the character of the liquid, the Duplex tube combination, composition of the tube sheet, and water boxes of the heat exchanger. One of the answers to this problem is collars or ferrules of the same material as the inner component of the Duplex.

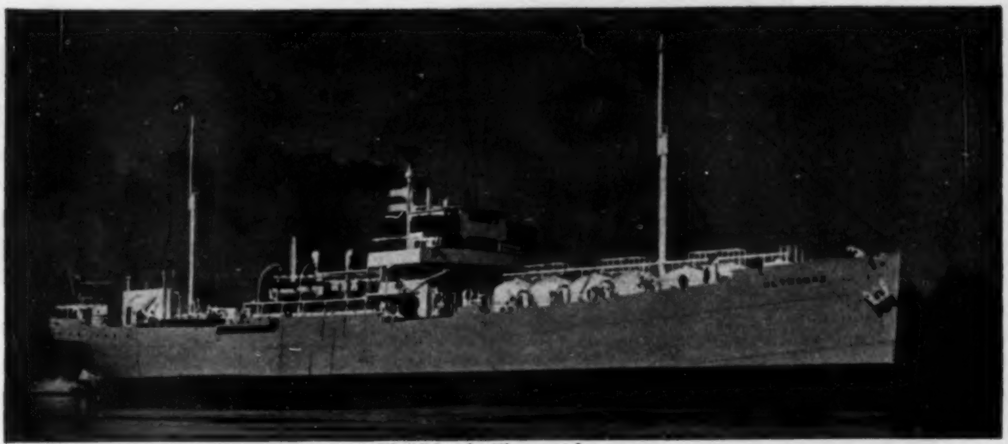
As a pioneer manufacturer of Duplex tubes, Bridgeport has been supplying cutback tubes and collars to fabricators. These collars have either been shipped separately or attached to the tubes depending on the desires of the fabricator. In recent years more and more concerns have asked to have these collars attached.

Although many manufacturers of heat exchange equipment have cutback tubes and attached collars, a close analysis of costs in their own shops will very likely show that Bridgeport's cost on this work will be competitive since necessary equipment is part of our regular production program.



Illustrating Duplex tube, both ends cut back; with sleeve attached to one end.

For further information on installation and use of Duplex, write for Technical Bulletin No. 1950. (6262)



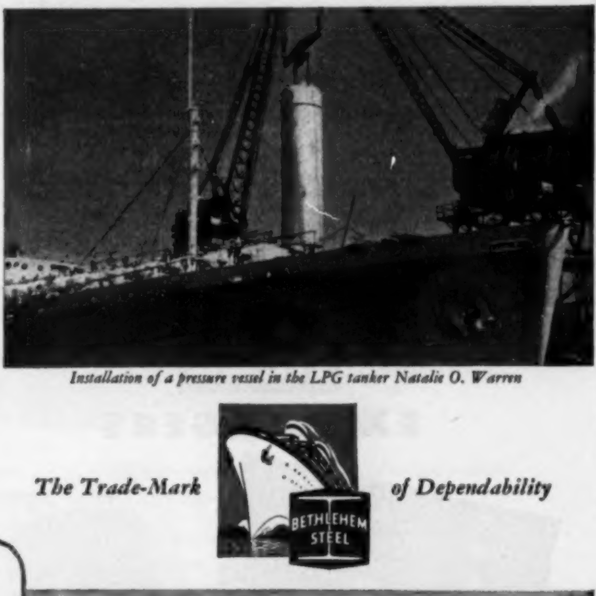
The LPG tanker Ultragaz under way

Liquefied Petroleum Gas Tankers by BETHLEHEM for MAXIMUM Economy Efficiency Safety

The *S. S. Natalie O. Warren* and the *S. S. Ultragaz*, converted at Bethlehem's Beaumont Yard from dry cargo vessels to liquefied petroleum gas tankers, represent the most economical and safest means yet developed for the transportation of bulk propane and butane gases.

They also reflect Bethlehem's ability to design and construct or convert varied craft for the most efficient mass movement of special liquid cargoes over *the oceans or on inland waterways.*

If you are a bulk shipper of special liquid cargoes we would be pleased to show you some of the economic, safety, and control advantages of transportation by specialized ships and barges. Your inquiry will be welcomed by Bethlehem—the nation's outstanding pioneer in the development of economical water-borne transport mediums for petroleum and its products.



Installation of a pressure vessel in the LPG tanker Natalie O. Warren

The Trade-Mark BETHLEHEM STEEL *of Dependability*

SHIP REPAIR YARDS

Boston Harbor	New York Harbor
Baltimore Harbor	Beaumont, Texas
Los Angeles Harbor	San Francisco Harbor

SHIPBUILDING YARDS

Quincy, Mass.	Staten Island, N. Y.
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BETHLEHEM STEEL COMPANY

Shipbuilding Division

General Offices: 25 Broadway, New York 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation

How and Where?

...Ross answers today's 2 big questions about heat exchangers

As all of us get deeper and deeper into the defense program, the questions "how" and "where" will obviously become more important and more frequent.

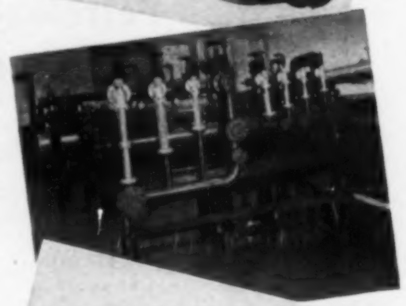
Today's the time, we think, to give you *our* answer to these vital questions, with respect to heat exchanger procurement. And we aim to make it a helpful answer . . . one that will accomplish the most good for all of us.

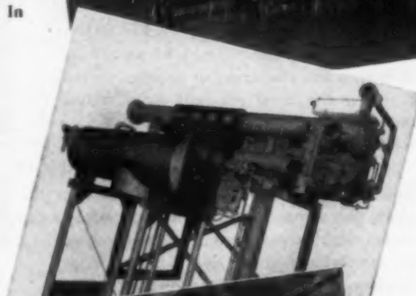
HERE'S WHAT WE CAN PROMISE . . . *DEFINITELY!* Ross can take over *your* problems *faster* . . . saving much of *your* time. As the pioneer and most advanced in heat exchanger standardization, Ross has the engineering know-how and the plant facilities to get your job going *sooner* . . . the knowledge and the skill to do it *better!* This applies to all types of heat transfer and allied equipment—exchangers, surface condensers, steam jet vacuum equipment—either fabricated from stock parts and standardized designs, or specially engineered from the ground up. And it applies to every phase of today's domestic and military needs—chemicals • plastics • power • synthetic rubber • powder • petroleum • metals—the same as it applies to fighting vessels • cargo ships • trucks—

Yes, our answer to "how" and "where" is "HERE"! For, no matter what your problem or application, Ross is a ready source of time-saving methods.

ROSS HEATER & MFG. CO., INC., Division of American Radiator & Standard Sanitary Corp., 1411 West Avenue, Buffalo 13, N. Y. In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

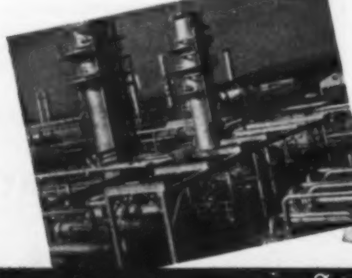
BUILT TO T. E. M. A. STANDARDS As a member of the Tubular Exchanger Manufacturers Assn., Ross fabricates in accordance with the published thermal and mechanical standards of T. E. M. A.

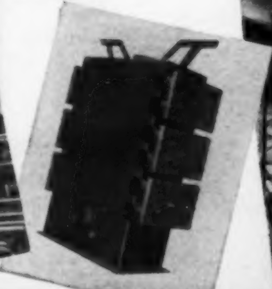


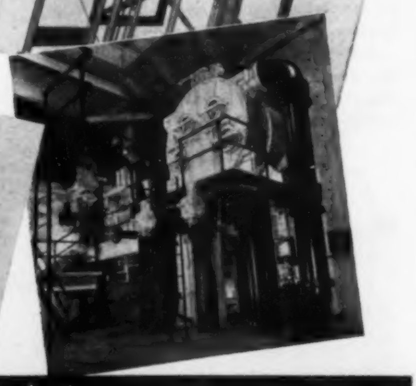


ROSS

EXCHANGERS



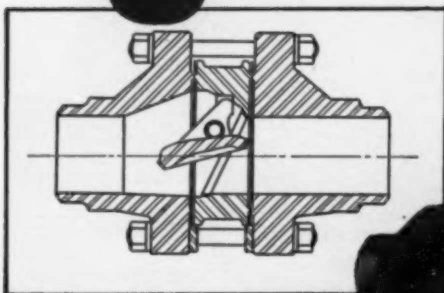




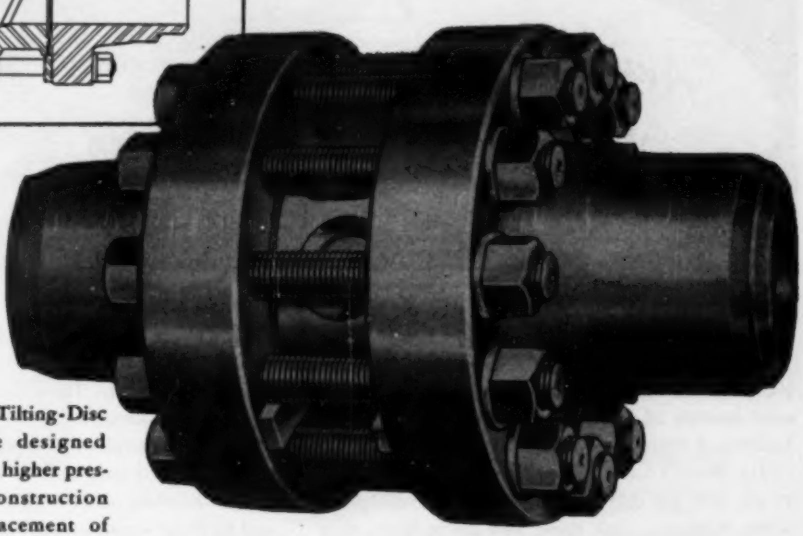
Serving home and industry

FOR HIGHER PRESSURES

3 Piece Tilting-Disc Check Valve



Has Removable Center Section for Quick and Easy Replacement of Operating Parts

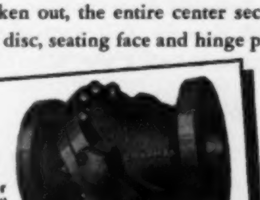


Here's a Tilting-Disc Check Valve designed specifically for higher pressures. Its construction permits replacement of operating parts, if ever necessary, without removal of entire valve from the line. Once the studs between inlet and outlet sections of the body are taken out, the entire center section (containing disc, seating face and hinge pins) can be removed. Replacement of center section is fast, easy — an important advantage.

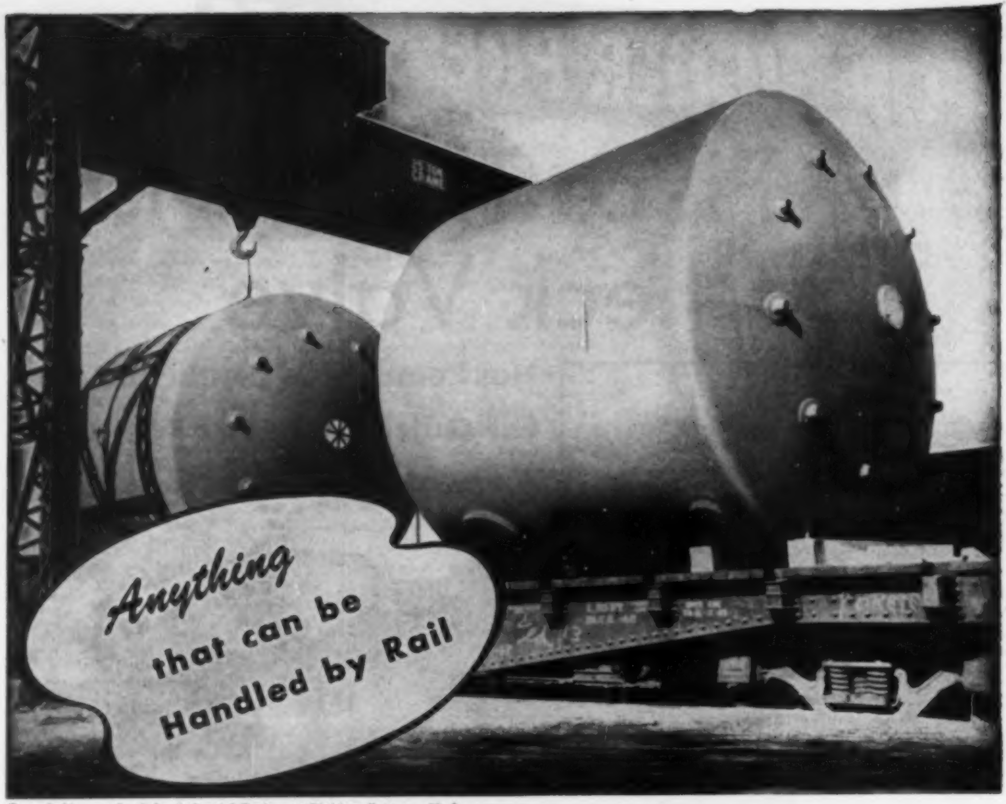
Important, too, is the smooth, easy operation obtained by the tilting-disc design. The balanced disc is held on the open stops by the velocity of the medium being handled. There's no slamming on closure to cause destructive pipe line stresses.

Write for complete description.

STANDARD 2-PIECE TILTING-DISC CHECK VALVES are available in either iron or steel for all pressures.



The Chapman Valve Mfg. Co.
INDIAN ORCHARD, MASSACHUSETTS



Part of shipment for Belco Industrial Equipment Division, Paterson, N. J.

...can be RUBBER LINED at Manhattan

If you are hesitating to rubber line your process equipment because of its size or complexity, consider the facilities of Raybestos-Manhattan ... "Giant"–"Huge"–"The World's Largest"–are terms rightfully applied to job after job that goes through the Passaic plant. Some Manhattan tank lining jobs are so large, their entire railroad routes have to be checked for height and width clearance. Some have to be transported in sections ... But nothing seems to overtax Manhattan ingenuity in handling the most difficult problems.

You can place complete confidence in Manhattan's tank lining capacity. The largest of a battery of vulcanizers is a mammoth chamber 15 ft. in diameter, one of the largest made. It accommodates anything that can be shipped on a railroad flat car. Other equally notable handling facilities insure careful transportation and thorough workmanship. More than 40 years rubber lining experience add to your assurance of quality.

Enduring, dependable protection of your equipment and processes from corrosion and contamination is sound economy. Call a Manhattan Rubber Lining Engineer to "talk it over" at no obligation.

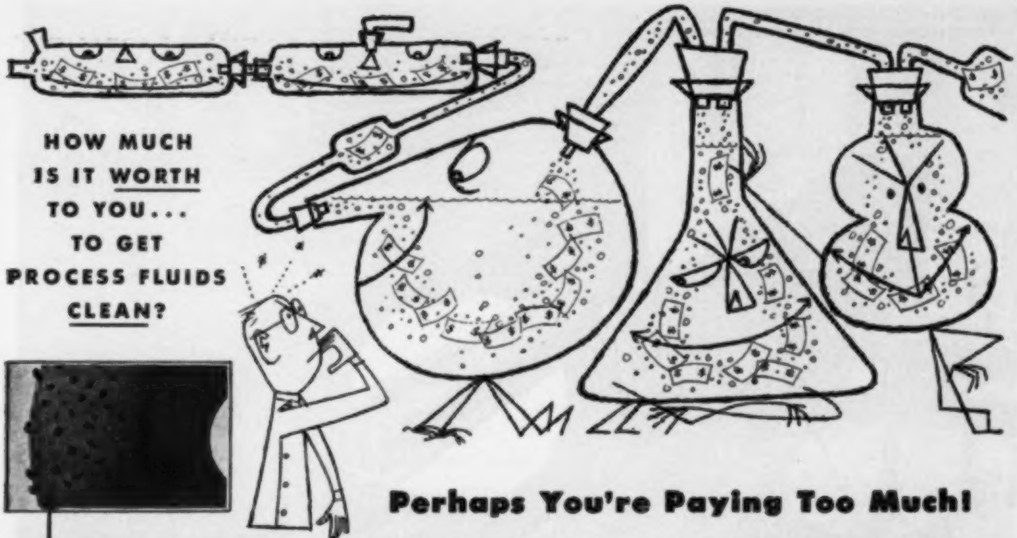
Keep Ahead with Manhattan

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

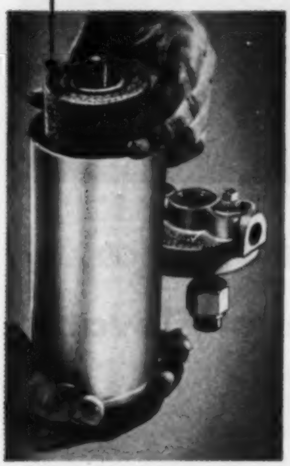
RM

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls



HOW MUCH IS IT WORTH TO YOU . . . TO GET PROCESS FLUIDS CLEAN?



Perhaps You're Paying Too Much!

Sometimes, it's worth a *lot*. You'll go to any expense to remove contamination.

But—in hundreds of cases, chemical firms are getting perfectly satisfactory results with the less expensive Cuno MICRO-KLEAN replaceable-cartridge filter.

SO YOU HAVE TO ASK YOURSELF . . .

1. *Will the* MICRO-KLEAN *do my job well enough?*

To help you answer: Cuno MICRO-KLEAN is guaranteed to remove all solids larger than specified* plus a large proportion down to 1 micron.

2. How much will the MICRO-KLEAN save me?

Well, the savings come from:

a. Lower initial cost

b. Lower maintenance cost—housing easily disassembled for cleaning—filter renewed by simple replacement of cartridges.

c. Lower replacement cost—MICRO-KLEAN's exclusive construction assures double life.

d. Positive mechanical separation—cartridge cannot shrink, swell, channel, or distort—fluid is protected.

INVESTIGATE MICRO-KLEAN NOW! This well-proved filter handles wide ranges of fluids at wide ranges of flow rates and viscosities . . . capacities from a few to over 800 gpm . . . connections from ⅜ in. IPS to 6 in. flanged.

*10, 25, 50 micron densities available
MICRO-KLEAN cartridges fit other makes; special lengths available for built-in installations.

CUNO

Complete Line
Fluid Conditioning
Removes More Sizes of Solids from More Types of Fluids

MICRONIC (Micro-Klean) • DISC-TYPE (Auto-Klean) • WIRE-WOUND (Flo-Klean)

WHAT'S YOUR CLEANING PROBLEM? SEE IF MICRO-KLEAN WON'T SOLVE IT FOR A FRACTION OF THE COST

☐ Absorption oils
☐ Cellulose acetate
☐ Chlorinated solvents
☐ Coal tar solvents
☐ Enamels
☐ Ethylene glycol
☐ Ethyl and methyl cellulose
☐ Glacial acetic acid
☐ Helium
☐ Industrial alcohols
☐ Lacquers
☐ Natural gas
☐ Nitrogen
☐ Paraffin
☐ Petroleum solvents
☐ Photographic developing solutions
☐ Pickling brines
☐ Sulphuric acid (up to 12%)
☐ Varnishes
☐ Water and water solutions

OTHERS ....

PLEASE ATTACH COUPON TO YOUR BUSINESS LETTERHEAD

CUNO ENGINEERING CORPORATION
102 South Vine Street, Meriden, Conn.

Please send me a free copy of your MICRO-KLEAN bulletin. I am especially interested in the services checked.

Name.............................Title.............

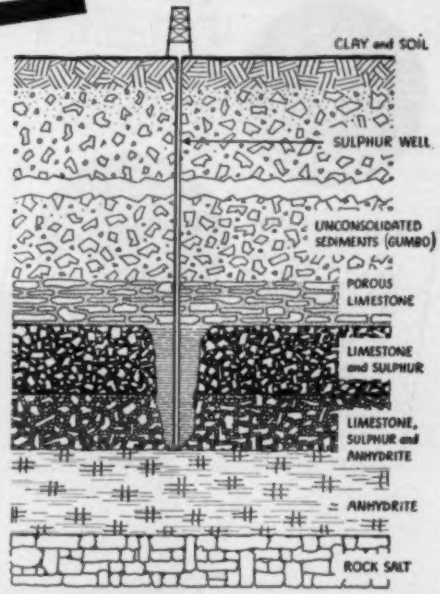
Company..

Address..

City.............................State...........

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region



*DEPOSITS . . .

Practically all of the elemental sulphur used in this country comes from mines in Louisiana and Texas.

There, the sulphur deposits occur in the cap rock overlying certain salt domes. The sulphur is mined at depths of 300 to 2,000 feet below the surface. It is melted in place by pumping into the deposit water heated under pressure to a temperature above the melting point of sulphur. The melted sulphur flows away from the limestone and is pumped to the surface where it is allowed to solidify in vats. By such means sulphur nearly 100% pure is produced.

Loading operations at our Newgulf, Texas' mine

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

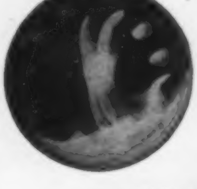
Mines: Newgulf and Moss Bluff, Texas

STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials

RECEIVING



The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.

DISCHARGING

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide ***a thoroughly blended product*** with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

STURTEVANT MILL COMPANY
100 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

Prepared Monthly by U. S. Industrial Chemicals, Inc.

U.S.I. CHEMICAL NEWS

February ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1951

New Anaerobic Varnish Has Interesting Possibilities

A material which remains liquid as long as a stream of air bubbles through it, but which hardens in a few minutes when away from air, is reported under experimental investigation. With properties opposite to those of paint, which hardens when exposed to air, the new material is able to penetrate extremely small cracks before hardening.

One use proposed for the new anaerobic varnish is to eliminate the lock nut needed to hold another nut tightly on a bolt. A few drops are placed on the threads of the bolt just before the nut is screwed on; the plastic is said to harden so tightly that very considerable force is required to remove the nut. Another potential use is for sealing leaks. The material may be applied to threaded joints in pipes, where the liquid penetrates into the crevices and then hardens. Also, if painted on porous castings, it is said to enter the pores and render the casting airtight.

Needs No Catalyst or Accelerators

Ordinary varnishes, scientists who developed the new material explain, contain some solid resin dissolved in a liquid solvent. When applied to a surface the solvent evaporates and the varnish remains as a hard layer. Such varnishes are difficult to use in some applications, for example, between pieces of metal placed closely together. The solvent nearest the air evaporates, leaving a skin of varnish which seals in the remaining liquid so that it cannot escape. This new solventless "varnish," on the other hand, undergoes polymerization and hardens fully without the necessity of any evaporation. With other solventless varnishes this is generally accomplished by heating, or by adding catalysts and accelerators, to speed the process. The new anaerobic varnish reportedly remains liquid as long as it is aerated. When away from air it solidifies quickly without heating or adding catalysts and accelerators.

Hardening Can Be Speeded

When two metal strips are coated lightly with it and clamped together, the scientists claim, the joint will support ten pounds after ten minutes. After 20 hours, it will hold 100 pounds. If still faster hardening is desired, the material may be heated, up to 212 degrees F. and solidification takes place in a minute or less. Chemists found that certain metals, such as copper, iron, and silver solder, exert an accelerating action on the hardening process, even at room temperature. Therefore they can be sealed more quickly than surfaces of glass and mica, which are inert, though they, too, can be tightly fastened. Paper and fabric also may be bonded to themselves and to other materials.

Nail Polish, the Detective

Mechanics at the engine overhaul base of a large airline are reported using nail polish to help prevent serious mechanical failures. When an engine is being reassembled, each screw connection in the electrical, hydraulic, fuel and oils system, is given a dab of nail polish. If a connection starts to work loose the break in the red stripe can be detected at a glance and the connection tightened. Nail polish is used because it dries fast, is bright in color, and has a handy brush applicator.

University Tests Clarify Importance of Antibiotics, Vitamin B_{12} in Feeds

U.S.I. Vitamin B_{12} Supplement, Made by Primary Bacterial Fermentation, Gives Better Growth Response than Pure B_{12}

The confusion which has existed in the antibiotic-vitamin B_{12} field during the past year is reported gradually disappearing under the influence of university tests and the recent ruling of the Feed Control Officials regarding the nomenclature of these materials. Today, leading animal nutritionists are described as agreeing that the responses obtained from vitamin B_{12} and antibiotics are entirely different and the requirements for each should be considered separately.

Where Vitamin B_{12} Should Be Used

Vitamin B_{12} should be added to all breeder rations at levels so as to supply approximately 15 milligrams of vitamin B_{12} per ton

Vitamin B_{12} should be used in conjunction with all antibiotics to obtain best results in practical rations for poultry, hogs, and turkeys. It also improves and maintains a satisfactory level of hatchability.

of finished feed. University tests have shown that the addition of antibiotics to breeding rations has little if any effect on the hatchability of eggs from hens receiving this ration. Vitamin B_{12}, on the other hand, does a complete job in improving and maintaining a satisfactory level of hatchability.

MORE

New Time-Saving Index To Government Paint Specs

In recent months many changes have been made in the government paint specifications system. Chief among these has been the grouping together of numerous military branch agency specifications under one military code as either "MIL" (Military) or "JAN" (Joint Army Navy). In addition, the government has issued several entirely new specifications.

One time-saver is the National Paint, Varnish and Lacquer Association's abstract booklet on "U. S. Government Paint Specifications Circular No. 743," issued in October 1950. This booklet includes a table of contents listed in alphabetical order according to the various government agencies. Many paint manufacturers, however, request information on a specification by its code number only, not knowing which government agency has jurisdiction over the specification in question. In cases of this kind, there is often much time lost in locating the proper abstract, since the various agencies have many different code prefixes for their specifications. A new U.S.I. "Key to Government Specifications" as abstracted in Circular No. 743 contains a cross index which enables one to identify the new prefixes or codes with the proper government agency. As an additional time-saver, it gives the designated agencies' addresses from which to procure specifications.

Offer German Patents On Synthetic Blood Plasma

Three German patents useful in producing synthetic blood plasma are reportedly being released for general royalty-free use in this country. The patents relate to the production of polyvinyl pyrrolidone, described as an essential ingredient in producing synthetic plasma.

Laboratory Safety Manual

A newly-revised edition of a laboratory safety manual, published by a large laboratory equipment manufacturer contains information on how to prevent laboratory accidents; first aid; fire fighting; and legal responsibility for providing safety information and devices, and laboratory safety equipment.

New 'Artificial' Tree Yields Natural Rubber

A new "three-component tree," representing a radical change from standard rubber tree propagating in the Far East, promises to solve the blight problem on rubber plantations in the American Tropics. First seedlings known for a highly efficient root are budded with high-yielding strains.

Then the top of the tree, which is still susceptible to blight, is "made over" by budgrafting on it an entire new cover of resistant leaves. This "blight-proofed" tree, designed for commercial plantation or farm grove, seems to fill all the principal requirements.

February ★ **U.S.I. CHEMICAL NEWS** ★ 1951

CONTINUED

Antibiotics, Vitamin B_{12}

Vitamin B_{12} should be used in conjunction with all antibiotics to obtain optimal results in practical rations for poultry, hogs, and turkeys. A deficiency of vitamin B_{12} will seriously depress any growth response which might be produced from an antibiotic. An excess of vitamin B_{12}, on the other hand, is of no benefit and is a loss to the feed manufacturer. Starter, grower and broiler mashes should contain approximately 12 milligrams of vitamin B_{12} per ton along with recommended amounts of antibiotics.

Vitamin B_{12} should be used in all calf feeds for animals under six months of age. It is especially important in milk substitute rations for young animals not yet receiving any roughage, since the rumen is still inactive at this early age.

U.S.I. is the only major producer of vitamin B_{12} feed supplements using a primary bacterial fermentation process which is not designed for antibiotic production. The primary fermentation product produces a growth response over and above that given by pure vitamin B_{12}. It is one of the best products for use in breeder formulations for poultry and turkeys as well as calf rations previously mentioned.

U.S.I. also has available an antibiotic feed supplement containing guaranteed quantities of bacitracin. For those feed manufacturers who desire an antibiotic and vitamin B_{12} supplement, U.S.I. has available a combination product. These products have given results which are equal or superior to those obtained using any other products containing antibiotics or vitamin B_{12} commercially available to the feed trade.

German Technical Reports

A new bibliography relating to captured technology from the German chemical, metallurgical and process industries has been announced. It contains over 2,000 document references with discriptive titles or abstracts and includes, in addition to a 6,000 entry subject index, author indexes, and cross-indexes with O.T.S., British, and U. S. military report numbers.

Radioactive Adrenaline

Radioactive adrenaline has been synthesized and is now being used to study effects in the body of this important drug which increases blood pressure, stimulates the heart, and is involved in transmission of nerve impulses in a part of the involuntary nervous system. Advantages of radioactive adrenaline for research are that it permits use of very small quantities of the drug, it makes possible detection of the radioactive part of the drug regardless of changes in the body, and it lends itself to detection and identification of excretory products.

First findings of tests made with the radioactive drug seem to indicate that adrenaline is removed from the blood by the body tissues, where it is converted into one or more new substances differing in properties from the original adrenaline. The new substances are then released from the tissues back into the blood stream where they are picked up by the liver and kidney for possible further change and excretion. Evidence indicating that adrenaline is converted into at least five substances in the body has already been obtained with the aid of the radioactive drug, it is reported.

New Radiation Detector Permits Direct Readings

A new atomic radiation detector, weighing less than a pound and about the size of a quart oil can, is claimed to permit direct radiation readings at a glance. It is described as having a self-contained power source. Radiation measurements are read from the monitor simply by noting the position of a pointer as it moves across a graded scale, it is reported.

The instrument is for use by engineers, scientists, doctors, and technicians who are working with or near sources of radiation, and can warn of the presence of radiation in amounts much less than those permitted by even the most stringent safety regulations, according to the engineers who developed it. This sensitivity, coupled with a continuously-visible indication, will give warning of a radiation hazard in an area while there is still time to avoid excessive exposure. This differs from the type of monitor that is read only at intervals, when it may already be too late to prevent an overdosage, the engineers said.

TECHNICAL DEVELOPMENTS

A specific and selective chlorinating agent, N-chlorosuccinimide is available now. High yields of benzoyl chloride from toluene and benzaldehyde from benzyl alcohol are reported. It is also recommended for treating contaminated water, particularly in small quantities. **(No. 649)**

Use of methionine in practical feed formulations is discussed in a newly-revised edition of a booklet on proteins and amino acids in animal nutrition. **(No. 650)**

A new household cleaner for refrigerators, ranges, washers, tiles, and other kitchen and bathroom fixtures, is said to remove discolorations from grease fumes and other similar trouble-makers and to offer remarkable resistance to further yellowing. **(No. 651)**

For control of industrial dermatitis, a new medicated cream described as soothing and stainless, is claimed to contain a new quarternary ammonium germicide and a greaseless base which permits rapid diffusion of ingredients over skin while still allowing pores to "breathe." **(No. 652)**

New multi-purpose type aniline inks reportedly give superior results on all standard types of cellophane, metallic foils, ethyl cellulose, and other specialty stocks. This one kind of ink can be used for a variety of stocks, instead of buying special inks for each type of stock. Fast dry and good adhesion are claimed. **(No. 653)**

New plastic-faced plywood, described as high grade exterior Douglas fir plywood bonded with phenolic adhesive and surfaced with a thermosetting resin, provides a glossy surface practically impervious to moisture, highly abrasive resistant, and having little tendency to check or show raised grain. **(No. 654)**

To slip a stirrer four inches wide through a one inch opening, a new "umbrella stirrer" while collapsed can be inserted through narrow-necked flasks, bottles, jars, etc., then opened wide. Its shape can be altered to produce the type of stirring wanted. **(No. 655)**

A glass filter paper described as being 5,000 times more effective than present commercially available filters and containing no foreign imports has reportedly been developed. The paper made of glass fibers 1/20th the thickness of human hair, is pervious to fungus. Added industrial uses are expected for the paper because of its electrical insulating properties. **(No. 656)**

A transparent natural rubber finish to renew and preserve indoor and outdoor surfaces can be applied to linoleum, furniture, leather, and to walls for damp-proofing. It dries dust-free in 20 minutes and is not harmed by acids, alkalis, and soaps, according to the makers. **(No. 657)**

A new rust inhibiting weather-resistant coating for ship's hulls, decks, superstructure, and machinery and for structural steel has a combination of aluminum pigments with potassium-barium chromate. **(No. 658)**

PRODUCTS OF U.S.I.

ALCOHOLS
- Amyl Alcohol (Isoamyl Alcohol)
- Butanol (Normal-Butyl Alcohol)
- Fusel Oil—Refined
- Propanol (Normal-Propyl Alcohol)

Ethanol (Ethyl Alcohol)
- Specially Denatured—all regular and anhydrous formulas
- Completely Denatured—all regular and anhydrous formulas
- Pure—190 proof U.S.P., Absolute—200 Proof
- Solox*—proprietary solvent—regular and anhydrous

ANTI-FREEZE
- Super Pyro* Anti-Freeze
- U.S.I. Permanent Anti-Freeze

ANSOLS
- Ansol* M
- Ansol* PR

ACETIC ESTERS
- Amyl Acetate—Commercial and High Test
- Butyl Acetate
- Ethyl Acetate—all grades
- Normal-Propyl Acetate

OXALIC ESTERS
- Dibutyl Oxalate
- Diethyl Oxalate

PHTHALIC ESTERS
- Diamyl Phthalate
- Dibutyl Phthalate
- Diethyl Phthalate

OTHER ESTERS
- Diatol*
- Diethyl Carbonate
- Ethyl Chloroformate

INTERMEDIATES
- Acetoacetanilide
- Acetoacet-ortho-chloroanilide
- Acetoacet-ortho-toluidide
- Acetoacet-para-chloroanilide
- Ethyl Acetoacetate
- Ethyl Benzoylacetate
- Ethyl Sodium Oxaloacetate

ETHERS
- Ethyl Ether, U.S.P.
- Ethyl Ether, Absolute—A.C.S.

ACETONE — A.C.S.

FEED PRODUCTS
- Curbay B-G*
- DL-Methionine
- Riboflavin Concentrates
- Special Liquid Curbay*
- U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
- Vacatone* 40

RESINS (Synthetic and Natural)
- Arochem*—modified types
- Arofene*—pure phenolics
- Aroflat—for special flat finishes
- Aroplaz*—alkyds and allied materials
- Congo Gums—raw, fused & esterified
- Ester Gums—all types
- Natural Resins—all standard grades

INSECTICIDE MATERIALS
- CPR Concentrates: Liquid & Dust
- Piperonyl Butoxide
- Piperonyl Cyclonene
- Pyrenone* Concentrates: Liquid & Dust
- Pyrethrum Products: Liquid & Dust
- Rotenone Products: Liquid & Dust

INSECTIFUGE MATERIALS
- Indalone*
- Triple-Mix Repellents

OTHER PRODUCTS
- Collodions
- Ethylene
- Nitrocellulose Solutions
- PIB*—Liquid Insulation
- Urethan, U.S.P.
- Special Chemicals and Solvents

*Reg. U.S. Pat. Off.

U.S. INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

WORMS EYE VIEW OF SAFE STORAGE

View shows bottom of recently erected 200,000 gallon Posey Iron Elevated Tank.

POSEY IRON STANDS READY TO *DESIGN* . . . *FABRICATE* . . . and *ERECT* elevated tanks in all capacities up to maximum. Posey Iron's experience in steel plate construction (dating back to 1910) eliminates needless production fumbling . . . cuts costs and speeds delivery.

All standard codes are met with adequate safety margins. Quality materials only are selected. Many Posey Iron installations are made with equipment performance guaranteed. Write today for free, illustrated 12-page reference bulletin.

POSEY IRON WORKS, INC.

Steel Plate Division • Lancaster, Pa.

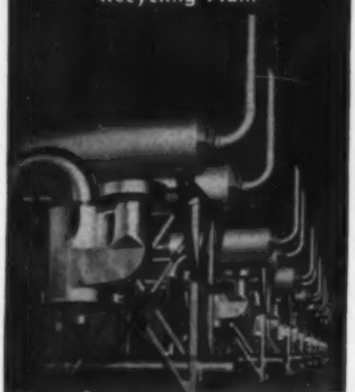
NEW YORK OFFICE, GRAYBAR BUILDING

DIVISIONS: BRICK MACHINERY • INDUSTRIAL HEATING • IROQUOIS • SHIPBUILDING • STEEL PLATE

In the Petroleum Industry

Look to BURGESS-MANNING
Leader in Engine and Compressor Noise Reduction

Recycling Plant



Burgess-Manning Snubbers used on Clark engines of the Cotton Valley Recycling Plant.

Pipe Line Station

Burgess-Manning Snubbers used in a pipe line station.

Almost twenty-five years' experience in the design and application of Snubbers has given Burgess-Manning the know-how to help solve your engine and compressor noise reduction problems.

Burgess-Manning Snubbers smooth the flow of exhaust gas or intake air without restricting gas flow. Exhaust or intake pulses of gas are effectively snubbed so that the oscillating flow of gas is smoothed to a unidirectional flow.

If you are installing engines or compressors, let Burgess-Manning submit Snubber recommendations. Long experience guarantees complete satisfaction.

BURGESS-MANNING COMPANY
LIBERTYVILLE, ILLINOIS

Pumping Station

Burgess-Manning Snubbers on 180-hp gas engines used by a Kansas plant.

Pressure Maintenance Plant

Burgess-Manning Snubbers used on engines of a pressure maintenance plant.

FROM WELL HEAD THROUGH THE REFINERY GATE . . . IT'S BURGESS-MANNING

Burgess-Manning Snubber installed on pipe line engine of the Magnolia Pipe Line Company.

12,500,000 TONS HANDLED...

was just a start for Rex Idlers

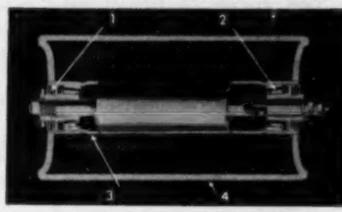
You'd think that carrying 12,500,000 tons of material would be a lifetime job for any belt conveyor idlers. After these rugged Rex Idlers handled that amount of aggregate for the Shasta Dam as a starter, the same idlers were installed on the longest, highest belt slope conveyor in regular service. And they're still going strong.

That's real proof that Rex Belt Conveyor Idlers give you lowest cost service . . . that they eliminate costly down time caused by premature idler failures. Not only do Rex Idlers last longer, they also are easy on the belt. They eliminate destructive belt pinching and creasing, and absorb practically no power. Special application idlers, such as Rex Impact Cushioning Idlers illustrated above (lower right hand corner), installed under loading points, protect belt from laceration and carcass failures.

For the complete story on these cost-cutting idlers, mail the coupon for your copy of Bulletin No. 463R.

REX BELT CONVEYOR IDLERS

These Rex Quality Features Add Life to Your Conveyors



1 Triple labyrinth grease seal . . . dust stays out, grease stays in.

2 Tapered roller bearings, deadshaft type mounting, oversize capacity.

3 Unit mounting for bearings for positive alignment and minimum friction.

4 Heavy duty one-piece welded steel construction for maximum roll life.

CHAIN BELT COMPANY 50-200
1648 West Bruce Street
Milwaukee 4, Wis.

Gentlemen:
☐ Send me my copy of Bulletin No. 463R.
☐ I would like to see a Rex Field Sales Engineer.

Name..

Company.................................*Dept*...........

Address...

City......................................*State*..........

STOP STREAM POLLUTION... *Automatically*

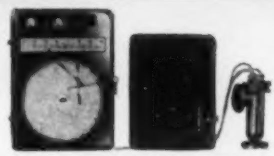
Bristol's pH Controller-Recorder puts plant waste neutralization on continuous, accurate, economical basis

If you are now neutralizing plant wastes manually—or are considering the installation of a neutralization system, a Bristol pH Controller-Recorder can standardize your results . . . prevent corrosion losses . . . utilize chemicals with maximum economy and safeguard stream and river purity.

A typical installation involves:

- a Bristol pH Controller-Recorder which continuously measures the pH of plant wastes and controls the flow of reagents to the mixing chamber to achieve a neutral value—
- and a Bristol Recording Flow-Meter which measures the volume of material to be treated, records the variations in the rate of flow and totalizes flow for record and cost-figuring purposes.

These Bristol Instruments are carried in stock for immediate delivery. Write for further information. THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 91, Connecticut.



Bristol Continuous pH Controller-Recorder

TYPICAL UNIT CHEMICAL-PROCESS APPLICATIONS FOR BRISTOL pH INSTRUMENTS

Neutralization . . . to show when reagents have carried reaction to desired pH value.

Coagulation . . . to indicate when optimum pH value is attained.

Precipitation . . . to insure complete precipitation and proper physical properties of precipitate.

Fermentation . . . to insure that material remains within the critical pH range for maximum action.

Electro-deposition . . . proper pH determines efficiency of base metal plating.

Other Applications . . . crystallization . . . absorption . . . filtering . . . bleaching . . . settling. Write for facts.

Bristol makes a complete line of instruments for controlling sewage and industrial waste disposal processes, including recording thermometers, liquid level instruments, flowmeters, pH instruments, recording gauges, pyrometers, telemetering instruments, and automatic controllers.

BRISTOL

Engineers process control for better products and profits

AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS

DORRCO DOINGS IN 1950

World conditions, as I write, are grim enough. They call for the response and concentration of purpose we know we would automatically get in an all-out war—but short of that, they do not come easily. The present situation is a tougher test for all of us, but one no less critical. The least profitable way to spend our attention and emotions now is in the search for scapegoats. If we were honest with ourselves, many of us would probably feel that our own ways of thinking or inaction had in some degree contributed to it. Let us apply this to the present and the future. They have enough to occupy us.

* * *

CLASSIFICATION—Our HX Classifier continues to take over the heavy-duty applications formerly handled by the FX. In this country nine duplex HX's are going in at an existing copper concentrator, while eight Quadruplexes and Quadruplex Bowls will be used in a 100 per cent expansion at another property.

The Dorrco Hydroscillator, and its work at Tennessee Copper, has been written about in several A.I.M.E. papers this year. This unit has reduced power consumption for fine grinding by yielding a definitely cleaner sand product. Its ability to produce clean, slime-free sand with only a small fraction of the water used in conventional hydraulic classifiers opens up promising new fields of application, such as the desliming of phosphate sands and the sand fractions of other non-metallic minerals.

JIGS AND CONES—The Dorrco Pan-American Jig continues to find favor in various types of dredge operations, and is now being applied to the beneficiation of iron ore in Minnesota and the concentration of tin ore in Malaya. The DorrClone (Dutch State Mines Cyclone) is entering new fields, notably the degritting of milk-of-lime and clay slurries, the desliming of mill tailings for use as mine back-fill, and the desliming of phosphate rock, sands, fine coal, and iron ore. Recently developed automatic control of discharge density has greatly improved operation under fluctuating feeds.

KRAFT MILL RECAUSTICIZING—1950 has been an active year in this field, with considerable replacement business and some expansion. Two-stage lime slaking, our new development, promises to improve control and assure a white digestion liquor of uniform strength, regardless of fluctuations in the burned lime feed.

SANITATION—The new Dorrco Aerator-Clarifier, a compact unit combining the functions of pre-aeration, flocculation and sedimentation in a single tank, increases the removals of suspended solids and B.O.D. over sedimentation alone.

Large-scale Dorr Multdigestion is used in recent installations at the Los Angeles Hyperion Plant for 245 million gallons of raw sewage per day, and Oklahoma City's Southside Plant, handling 25 million gallons.

Miami, Florida, is installing four 69 ft. dia. Dorrco Hydro-Treators to soften up to 52 million gallons of water a day at their new plant.

CANE SUGAR—There has been great activity this year in cane sugar, particularly in Brazil, where many factories have purchased our new Multifeed Clarifiers and Oliver-Campbell Filters.

ABROAD—Our six associated companies in Europe have been increasingly active and have handled a record volume of business. Three of them celebrated their 25th Anniversary in 1950, although one, Dorr-Oliver, Ltd., started as an agency in 1911. Another one, our seventh, Dorr-Oliver (India) Ltd., started this year.

Projects have included causticizing plants for Portugal and India, another fertilizer plant for Greece, and equipment for base metal production in Italy, Morocco, and the Middle East. India has a Biofiltration Plant operating in Bombay, with others under construction, and water plants for textile production.

Our first completely modern plant for the primary treatment of sewage in South America is under order for Recife, Brazil, to care for 130,000 people. Vacuum filtration and flash drying of sludge, plus the generation of power from sewage gas are to be features new to South American practice.

ION-EXCHANGE—All of the beet sugar factories employing our Ion-Exchange Systems report continued satisfactory operation and increase in the recovery of sugar. Our Continuous Water Softener, based upon ion-exchange principles, has been demonstrated commercially for municipal water supplies, and is also applicable to softening low pressure boiler feed water.

CONSULTING ENGINEERING—The Consulting Engineering Department is serving a broad and expanding field. Highlights this year were a pilot plant for the leaching, roasting and electrolytic treatment of copper ore in Michigan; the modernization of an old gold milling plant in South America, and the handling of a complete chemical fertilizer project in Greece.

FLUOSOLIDS AND FLUODRY—FluoSolids Systems for calcining refractory gold concentrates are being installed at Cripple Creek, Colorado, and one additional System added to the two existing systems at Red Lake, Ontario. Roasting of zinc sulfide concentrates has received much attention during the year, with one test unit being installed and another under design for this country.

The shortage of elemental sulphur, both here and abroad, has emphasized the need for securing more sulphur by roasting the plentiful supplies of iron sulfides—an ideal application for FluoSolids.

FluoDry, a newly developed application of the FluoSolids technique to drying and sizing fine material is being tried on 100 mesh dolomite to both dry and size at that mesh at a rate of 30 tons per hour.

* * *

The beginning of the year found us completing our general office move to Stamford, Connecticut, from New York, and making the required personal and corporate adjustments. The consensus of both staff and observers is that it has been a forward step which has added to our ability to serve.

Some time ago I came into the office and found an associate tearing his hair over something gone wrong. I had just read a review of Dr. Edward Hume's book "Doctors East and West" which told how, when his life's work at "Yale in China" seemed crumbling and his life in danger, he remained calm and full of faith. I told him the story and said then, "I, also, will not worry . . ."

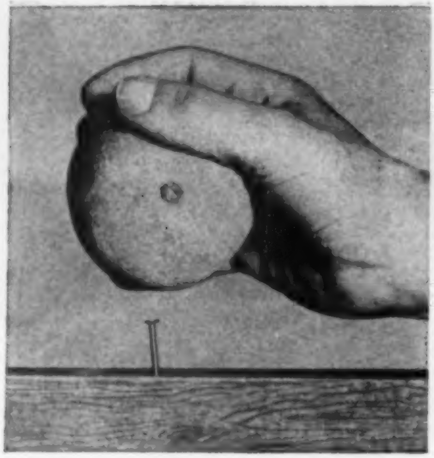
Today, I think again that "Faith" and a serene belief in the final triumph of "Good" is our salvation.

To all friends "World-Wide" and our staff and associates comes our belief that the New Year will bring blessings.

John V. N. Dorr

Barry Place, Stamford, Conn.

DORRCO



A 500-liter Dewar Flask, made of Monel®, used for transporting liquefied gases. Hofman Laboratories, Inc., of Newark, N. J., chose Monel for this service because it has the necessary strength and toughness at -330°F., and because Monel takes a mirror finish required for very high insulating vacuum.

What happens when temperatures DROP?

Many materials behave strangely at sub-zero temperatures . . . but Inco Nickel Alloys often have *improved* characteristics . . .

When the mercury freezes solid . . . and the temperature keeps on falling, common objects develop startling traits.

An orange can be used to drive a nail. A rubber ball shatters under a hammer blow. A garden hose becomes a rigid bar that will support your weight.

To the designer of low-temperature equipment, these unfamiliar antics pose serious problems. Many metals become excessively brittle . . . often to the point of being useless as structural materials. For example, an alloy steel, with a room temperature impact strength of 119.8 foot-pounds, showed a drop in impact strength to only 6.4 foot-pounds at the temperature of liquid nitrogen. Other carbon and low alloy steels show similar tendencies.

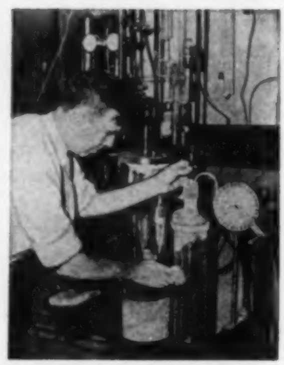
The key that has unlocked many such problems is *nickel*. Used as an alloying element in steels, nickel decreases low-temperature embrittlement.

The Inco Nickel Alloys, Monel, Nickel and Inconel, actually *increase* in strength when temperatures drop, and without appreciable change in ductility.

In addition to very superior low-temperature characteristics, the Inco Nickel Alloys offer several other important engineering advantages . . . excellent resistance to the corrosive action of a wide variety of chemicals, workability and weldability, good resistance to both stress- and vibration-fatigue.

Among the many low-temperature applications, where Inco Nickel Alloys can prove highly successful, are: producing, handling and storing of liquefied gases; laboratory research, low temperature treatment of metals.

Since nickel and nickel alloys are in short supply right now, you may not be able to get all of these materials you want for your low-temperature requirements. However, for helpful advice on metal problems, feel free to consult Inco's Technical Service Section. They will be glad to help you—without cost or obligation, of course.



Helium liquefier at the National Bureau of Standards, used to study the behavior of the gas at -455.75°F. – less than 4 degrees above absolute zero. Heart of the apparatus is a thick-walled Monel chamber in which helium is cooled under pressure, preparatory to expansion and liquefaction.

EMBLEM OF SERVICE

NICKEL INCO ALLOYS

MONEL® • "R"® MONEL • "K"® MONEL
"KR"® MONEL • "S"® MONEL

• • •

NICKEL • LOW CARBON NICKEL
DURANICKEL®

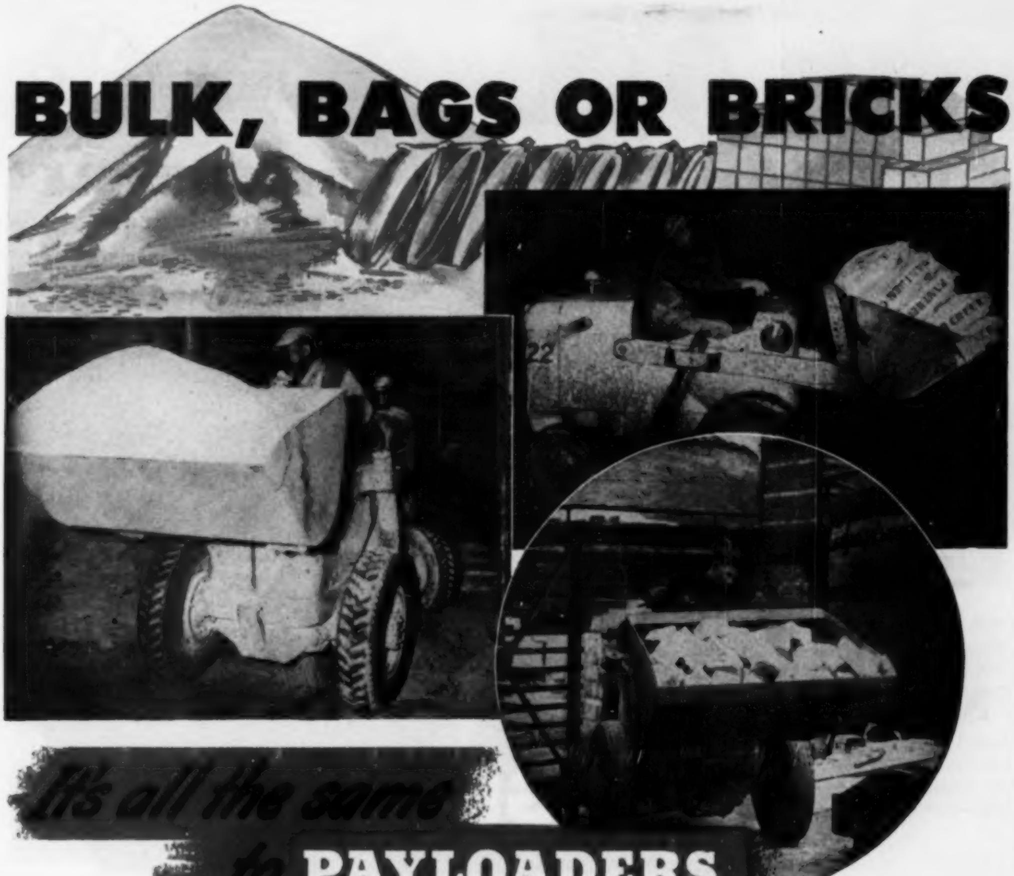
• • •

INCONEL® • INCONEL "X"®

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

BULK, BAGS OR BRICKS



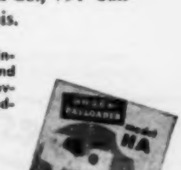
It's all the same to PAYLOADERS

"PAYLOADERS" are designed to handle all bulk materials encountered in the chemical and fertilizer industries. Thousands of them are at work in these industries at these tasks reducing costs, increasing production and adding flexibility to operations.

"PAYLOADERS" have the power and traction to scoop up big bucket loads of tough, lumpy, granular, sticky or abrasive materials . . . have the speed and maneuverability to carry their loads *fast* outdoors or indoors, over hard surfaces or ground, mud or snow . . . to work in close quarters, to unload box cars. They dump their loads directly into piles, trucks, cars, bins, containers or hoppers—high or low, slow or fast—by means of controlled hydraulic power.

It will pay you to get complete facts about unique unit-design "PAYLOADERS" and how they can serve you . . . facts based on Hough's 29 years of material handling experience and that of the world-wide Distributor Organization that sells and services them. The Frank G. Hough Co., 754 Sunnyside Avenue, Libertyville, Illinois.

Catalogs about "PAYLOADERS" include many varied application photos and job data. They're yours for the asking, covering the 12 cu. ft. Model HA, the ½ yd. Model HE, the ¾ yd. Model HF, the 1¼ yd. Model HL, or the big 1½ yd. Model HM.



PAYLOADER®

Manufactured by THE FRANK G. HOUGH CO.

DEPENDABLE

under severest conditions of dust and dirt!

DODGE-TIMKEN

● Even under layers of grime, dirt and abrasive dust encountered in many production operations, the Dodge-Timken Type C bearing carries its power load smoothly, efficiently, without interruption—because it's

● Triple-sealed to prevent the entry of dust, however fine. Accurately machined steel seals keep dirt *out* and lubricant *in*.

● Dodge mounts, seals, houses Timken precision bearing units in rugged assemblies (four different types) to deliver a minimum of 30,000 hours uninterrupted service.

● Dodge Timken Type C Pillow Blocks are fully self-aligning, with both radial and thrust carrying capacity.

● Delivered fully assembled, adjusted and lubricated, ready to lock on shaft. Locking collars at both ends insure firm fastening.

● Normally available from Dodge Distributors' stocks, sizes from 1-7/16" to 4-15/16".

DODGE MANUFACTURING CORPORATION, 200 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor for assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.

DODGE

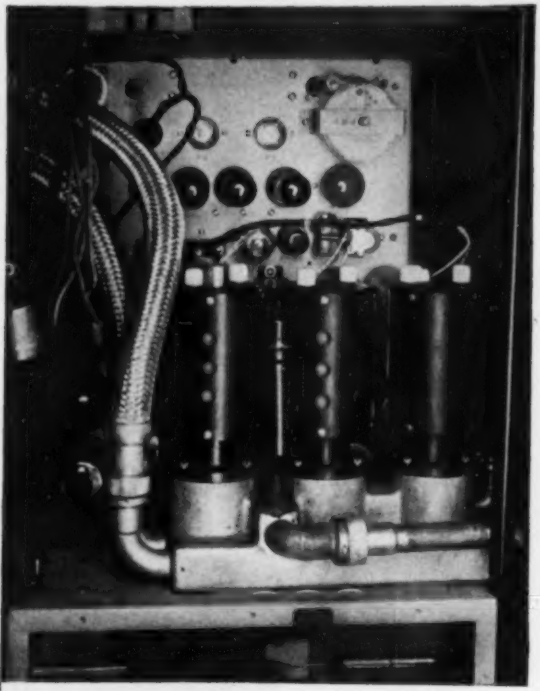
of Mishawaka, Ind.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES · TORQUE-ARM SPEED REDUCERS · ROLLING GRIP AND DIAMOND D CLUTCHES · SOLID STEEL CONVEYOR PULLEYS

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO, ILLINOIS


SULFUR
RECOVERY
from waste gases
ANOTHER FOSTER WHEELER INSTALLATION—
THE LARGEST IN THE WORLD—YIELDS
SULFUR —from a new source
Once again, a Foste eler plant proves that the recovery of sulfur from sou ral gases and spent gases in refining operations d business. Over 300 tons of high grade sulfu are recovered by the Texas Gulf Sulphur Compa at Worland, Wyoming, which was placed n April, 1950.
Today, the plants installed by Foster Wheeler have a total capacity of 600 or more tons per day, a substantial contribution to the development of the country's resources of sulfur—an essential element for the chemical, petroleum, fertilizer, steel, and other industries. Foster Wheeler has been identified with this development since the first commercial installation in the United States in 1942.
For further particulars, write:
FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK 6, N. Y.
FOSTER WHEELER



CORRUGATED TRANSITE* ... *alone or in combination with other materials*

*Transite is a registered Johns-Manville trademark

You can build the entire exterior with these streamlined sheets...

or use them equally well with other materials to develop attractive contrasts.

Transite sheets can't burn, rot, or rust—and they're not expensive.

When Corrugated Transite is used by itself for exterior walls, the effect is often one of massive, streamlined simplicity, as you can see by the appearance of the gigantic plant, upper left.

Combined with stone, brick, or glass, Johns-Manville Corrugated Transite helps create striking architectural contrasts, as in the United Airlines Maintenance Base in San Francisco.

Applied either vertically or horizontally, the corrugations in the Transite sheets cast the pleasing shadow lines so desirable to architectural design.

The natural light gray color of Transite is attractive without further decoration, and the material itself never needs paint to preserve it. In fact, Corrugated Transite is *rotproof, weatherproof, fireproof.*

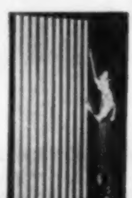
The large sheets permit rapid application, a minimum of framing, lower construction cost. When need for alteration arises, the sheets are almost 100% salvageable. If you plan to build—*and particularly if you have a problem of rapid industrial expansion for military defense*—investigate the possibilities of Corrugated Transite. Write Johns-Manville, Box 158, Dept. FM, New York 16, N. Y.

EASY TO FASTEN TO STEEL

EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

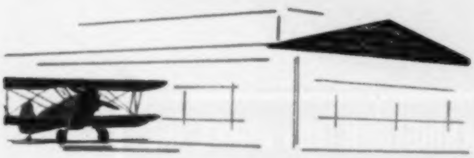


JM

Johns-Manville *Asbestos* **CORRUGATED TRANSITE**

SW SPROUT WALDRON MUNCY, PA *pointers* to **BETTER PROCESSING**

Spatula Test—Yardstick of Perfect Blending

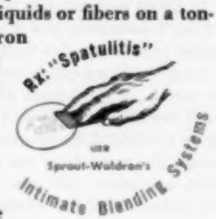


Powdered insecticides and fungicides must be uniformly blended and free of lumps. This is particularly important when the modern method of air-dusting is used for crop protection.

The Vahlsing Insect and Disease Control Service of Robbinsville, N. J. is one of the leading companies in the East engaged in air-dusting. Here is what Joseph P. McKenna, General Manager of the Vahlsing plant says about their S-W Blending Systems:

"Our equipment turns out a perfectly blended dust—free from streaks, at a most satisfactory rate. The *Spatula Test* proves our products have nothing to fear from the competition."

If you want to blend powders 100 mesh and finer, or combine them with liquids or fibers on a tonnage basis, a Sprout-Waldron Blending System is likely to offer you distinct advantages.



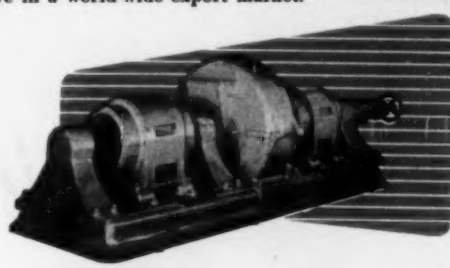
Here are just a few diversified products blended in Sprout-Waldron Systems: weed killers • industrial cleaners • ceramic bonding formulas • livestock mineral tonic blends • asbestos brake-lining formulas • joint finishing plaster • battery case formulas.

Size-Reduction May Be Your Problem, Too!

Shellbuilder Company faced it in Houston, Texas over 25 years ago.

The product to be crushed was *oyster shell.* Uniformity of size range was a requisite—with capacities in tons per day. Average temperature of product at the time of grinding 200° F.

Obviously, the equipment for this work had to withstand severe punishment without expensive breakdowns. Product cost per ton had to be competitive in a world-wide export market.



Shellbuilder's choice in 1925 was two Sprout-Waldron 36" Double Runner Attrition Mills. Today, these same units are still in use. Capacity is still high. Plate life—1600 tons of oyster shell per set!

Many industries are rediscovering the basic advantages of this trouble-free mill on such varied assignments as grinding, cutting, shredding, pulverizing, granulating, etc.

For further information write to Sprout, Waldron & Co., Inc., 15 Waldron Street, Muncy, Pa.

Sprout-Waldron
Manufacturing Engineers
SINCE 1866
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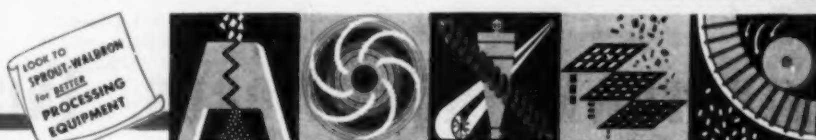
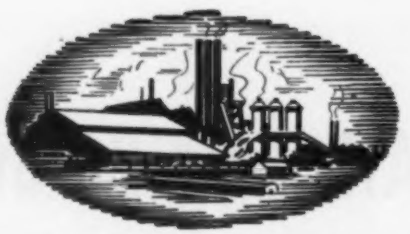


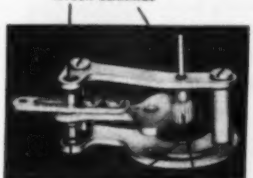
178

SIZE REDUCTION · MIXING & BLENDING · BULK MATERIALS HANDLING · PRODUCT CLASSIFICATION · PELLETING & CUBING



THE STANDARD OF THE INDUSTRY
is the Ashcroft DURAGAUGE
WITH NYLON MOVEMENT*

The Ashcroft Duragauge with Nylon Movement



*Pat. Applied for

Why? You need look no further than the unmatched record of Duragauge performance under the most "killing" service conditions to be found . . . facts that have brought about the unqualified specification of Duragauges for the most demanding new installations in both the petroleum and chemical fields.

It is, as engineers will verify wherever Duragauges are installed, the product of the most realistic approach to modern gauge design ever made for the accurate indication of pressure.

The Nylon Movement . . . bearings and pinion gear shown in the illustration, is exclusive with the Duragauge and provides unprecedented impact absorption, retention of form and shape under high temperatures, low friction and corrosion resistance.

The Extra Width Bourdon Tubes, perfected by Ashcroft engineering in a complete range of materials to meet any service conditions, give greater sensitivity to slight pressure change. (All Bourdon Tube assemblies are whip-tested before shipping at pulsating pressures 50% higher than the tube rating!)

Unusually Long Tip Travel provides greater accuracy of indication.

Mounting Design of Rotary Movement enables recalibration of gauges in the field with maximum accuracy in minimum time.

Sturdy, Fully-Protective, Lifetime Cases in a choice of materials and available for stem mounting, wall mounting, or flush mounting.

Inherent with these and many other features of Duragauge design is the high "quality throughout" standard that has identified all products of Ashcroft pioneering development and manufacture for more than 100 years.

Your distributor is prepared to give you every assistance in the proper application of the Ashcroft Duragauge with nylon movement for new and rehabilitated installations. He invites your inquiries.

MAXWELL MANNING & MOORE INC. MM&M TRADE MARK

ASHCROFT *Gauges*

1850 ASHCROFT U.S.A.

A Product of

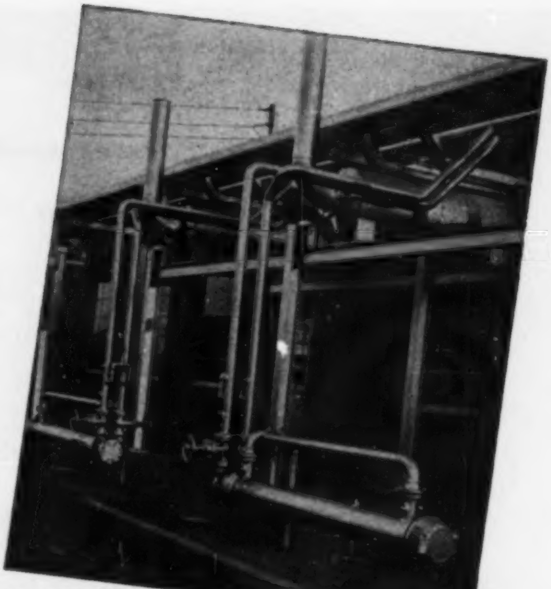
MANNING, MAXWELL & MOORE, INC.
STRATFORD, CONNECTICUT

Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments. Builders of 'Shaw-Box' Cranes, 'Budget' and 'Load Lifter' Hoists and other lifting specialties.

Why LK-FIN

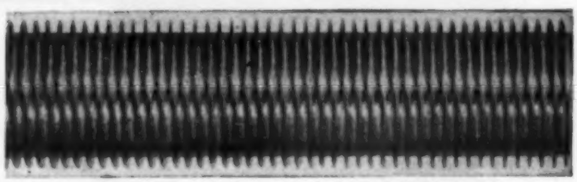
means a more effective... compact and economical

LUBE OIL OR JACKET WATER COOLER



Representative installation of two LK-Fin Coolers for cooling diesel engine jacket water.

Single-pass LK-Fin Cooler viewed from stationary head end



Portion of the helical-finned element used in the LK-Fin Cooler

It's because of the *fins* on the cooling elements. These fins greatly increase the external heat transfer surface . . . enable a considerably shorter tube to perform the same cooling effect that requires a much longer bare tube.

The results . . . a more compact cooler because of the more effective heat transfer surface . . . a more economical unit because of the shorter tubes and shell.

What diameter . . . thickness . . . pitch . . . should the fins be to accomplish these results? That's where G-R's unmatched know-how comes in . . . a knowledge gained from 20 years of experience in building *finned-type* heat exchangers and the results obtained from many tens of thousands of installed finned-tube units.

And the exclusive use of LK-Fin tubes is only one of the many distinctive features of these coolers. Write for bulletin describing them in detail, with rating tables and selection data.

THE GRISCOM-RUSSELL CO., 285 MADISON AVE., NEW YORK 17, N. Y.

GR-282

GRISCOM-RUSSELL

PIONEERS IN HEAT TRANSFER APPARATUS

. . . . SOLVING CHEMICAL HAULING PROBLEMS IS A FRUEHAUF SPECIALTY!

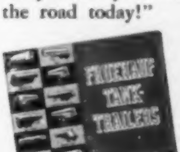
LIQUID LATEX — Capacity 3250 gals. Single compartment. 2 inches of rock-wool insulation, plus Steel jacket, over a 60" inside diameter tank. Safe working pressure 50 lb. per sq. inch.

LET FRUEHAUF SOLVE YOUR CHEMICAL HAULING PROBLEMS TOO!

WHEREVER chemicals are moved from one place to another, you'll see Fruehauf Trailers. Fruehauf's are designed to a liquid hauler's needs. They're light in weight yet extra sturdy, with feature after feature for making the job easier . . . faster . . . safer.

Constant contact with the chemical industry by Fruehauf field men keeps Fruehauf always ahead with the latest in engineering, in design and product development. Special needs or unusual problems are quickly solved by Fruehauf. Fruehauf production facilities assure prompt delivery with a minimum of waiting.

Ask the nation's leading operators about Fruehauf Trailers. They'll tell you—"They're the best built Tank-Trailers on the road today!"



A catalog of Fruehauf Tank-Trailers, with both standard units and "specials" fully described and illustrated, is available *free* upon request. It contains a great deal of valuable information for every Tank-Trailer user. Write *Fruehauf Trailer Co., 10964 Harper, Detroit 32, Michigan.*

A COMPLETE LINE

Fruehauf has a complete line of Tank-Trailers for most every liquid hauling need, most of them "standards" in the line. If you require a "special", Fruehauf will design it to your needs, then follow through with its manufacture. This complete service "pays off" with a unit that's *built right* to *last longer, perform better* . . . with a nation-wide service organization to keep Trailers operating at top efficiency.

"ENGINEERED TRANSPORTATION"

FRUEHAUF *Trailers*

This time...

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WIGTON-ABBOTT'S

Complete Service

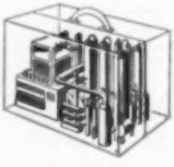
FROM

PLANNING

TO

PRODUCTION

"Packaged Plant Construction"



A service by Wigton-Abbott Corporation that broadens the definition of plant construction to include creation of the process, designing and installation of equipment, and "delivers" the complete plant, ready for operation. ● To perform and to coordinate these complex functions, Wigton-Abbott Corporation employs the experience and skill of engineers and architects—including specialists in all branches of chemical, mechanical, electrical, civil and industrial engineering. The Construction Department is staffed and equipped to erect any type of industrial plant. ● A Wigton-Abbott Corporation representative will be glad to consult with you on any phase of plant design and construction.

Yours for the asking

"Packaged Plant Construction"

Reading time, only 10 minutes—but it will save you many hours by answering basic questions.

Wigton-Abbott Corporation

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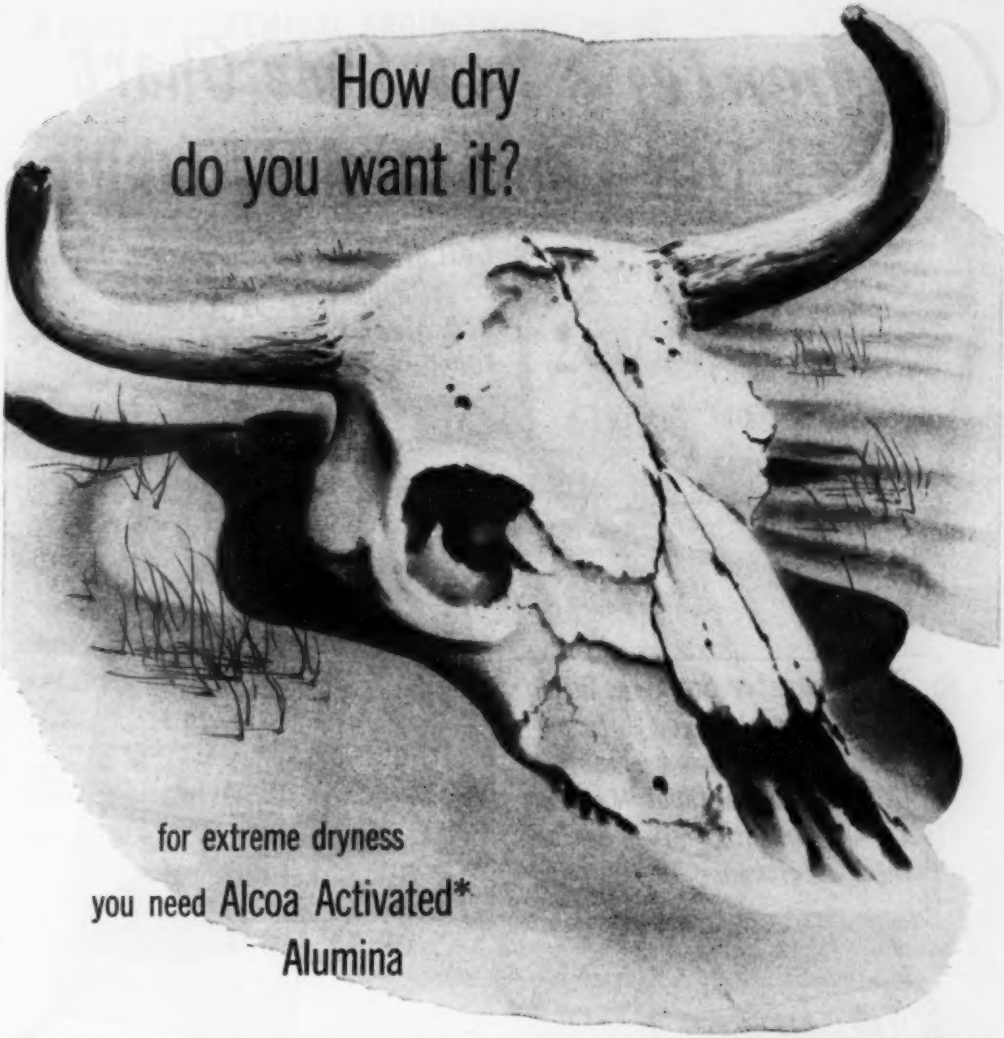

If your business calls for the dehydration of liquids, vapors or gases, you'll want to be familiar with ALCOA *Activated* Alumina. It is one of the most effective and efficient desiccants you can buy. Dew points as low as *minus 100° F.*—and even lower—can be obtained, and under normal conditions, ALCOA *Activated* Alumina can be used for an almost indefinite number of drying cycles.

ALCOA *Activated* Alumina is a commercially pure, highly inert adsorbent. It has high resistance to crushing, shock and abrasion . . . will not swell, soften or disintegrate even when immersed in water . . . is non-toxic . . . non-corrosive . . . practically iron-free. And its relatively low initial cost makes it extremely economical to use.

It is properties such as these that give ALCOA *Activated* Alumina its wide acceptance as an outstanding drying agent. Its desiccating properties are used in the chemical, food, pharmaceutical and petroleum industries, in air conditioning and for the maintenance of oils.

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Coil diameters for Stainless Steel Pipe from 1/8" to 4" are given in easy-to-use form.

The Carpenter Stainless Tubing Slide Chart gives you data on Analyses, Standard Sizes, Bends with and without Mandrels, Tensile Strength, Rockwell Hardness, Heat Resistance, etc.

If you would like a copy of this useful Slide Chart published by Carpenter, just drop us a note on your company letterhead. We'll be glad to put one in the mail for you.

THE CARPENTER STEEL COMPANY
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STAINLESS TUBING

Analysis — Tolerance — Finish

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The ability of Nash Compressors to maintain original performance over long periods is no accident. Nash Compressors have but a single moving element, the Nash Rotor. This rotor is precision balanced for long bearing life, and it revolves in the pump casing without metallic contact. Internal lubrication, frequent cause of gas contamination, is not employed in a Nash. Yet, these simple pumps maintain 75 lbs. pressure in a single stage, and afford capacities to 6 million cu. ft. per day in a single compact structure.

Nash Compressors have no valves, gears, pistons, sliding vanes or other enemies of long life. Compression is secured by an entirely different principle of operation, which offers important advantages often the answer to gas handling problems difficult with ordinary equipment.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. Because there are no internal wearing parts, maintenance is low. Service is assured by a nation-wide network of Engineering Service offices. Write for bulletins now.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature Automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
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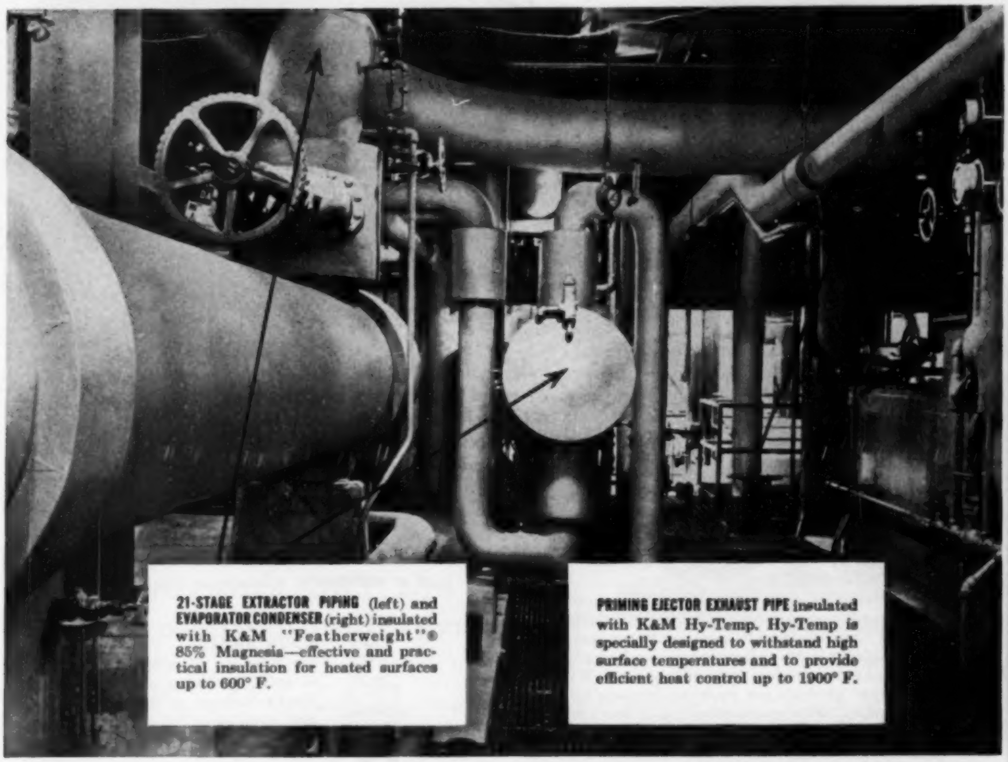
Public Service Co. of Oklahoma uses K&M Insulations in Weleetka Power Station



Insulation Contractor: Armstrong Cork Company

These K&M insulations keep steam hotter—longer—at less cost!

In power stations, oil refineries, chemical plants, factories, steamships, hospitals—in fact, wherever exacting steam control is a must—you'll find K&M "Featherweight" 85% Magnesia and K&M Hy-Temp Insulations. These two K&M products give you highly efficient, cost-cutting insulation in every service temperature range. And, for especially difficult heat control situations, the advantages of both are combined in K&M Hy-Temp Combination Insulation.

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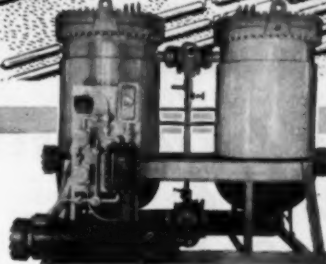
MOISTURE IS TABOO IN THESE NATURAL GAS STORAGE SYSTEMS

Stone & Webster Engineering Corporation have built such underground gas storage systems ranging from 1,500,000 to 120,000,000 cubic feet.

Lectrodryers DRY the gas as it's pumped underground



Type BWC-1500 Lectrodryer

Expand that gas from the 2240-pound storage pressure to 125 pounds for delivery to the mains and any moisture present would cause freeze-ups. Also, moisture in the gas would corrode the steel tanks and form hydrates.

Lectrodryers head off all that trouble. Installed in the compressor stations, they DRY the gas right at the start.

Whatever your DRYing problem—air, gases or organic liquids—there's a Lectrodryer to solve it, efficiently and economically. Usually there's a standard machine to handle the job but, if not, Lectrodryer engineers will design and build the equipment you require. No need to take valuable time designing your own.

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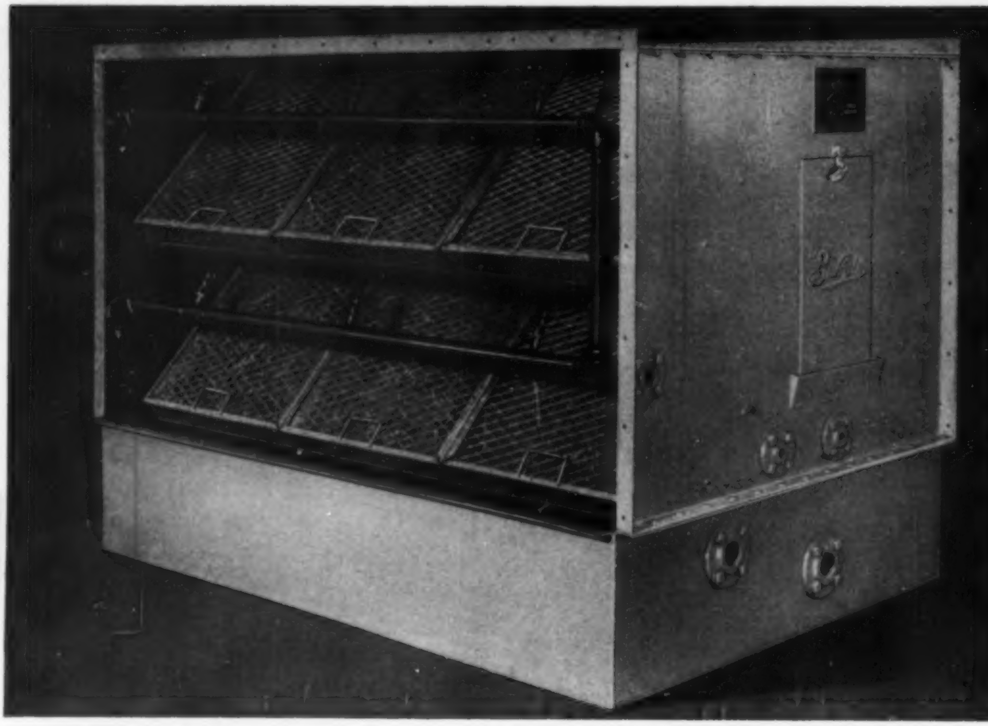

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"Buffalo" Air Washers are still built to the basic "Buffalo" design proven on the job for many years—because we know it is the most efficient design so far. Efficient "Buffalo" Pumps for the spray water, "Buffalo" Spray nozzles, and efficient eliminator plate design — durable, heavy tank and panel casing—are part of each unit. Changes which have been made have been to simplify servicing and maintenance. WRITE FOR NEW BULLETIN 3181-B and BULLETIN 3457 for the unit you require—for dust removal, for dust salvage, for humidity control. "Buffalo" builds a type for every need.

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No matter where you sit

—Here...

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...you'll find it pays to make full use of

NATIONAL *service on* **LEAD EQUIPMENT**

Whether you're in planning or production ... take advantage of NATIONAL service whenever you need lead equipment for handling corrosive chemicals.

That means lead equipment in any form. Sheet or valves. Simple lead coils or custom-made processing vessels. Complicated acid-recovery equipment or a short run of pipe.

Take lead pipe as one example. If you want help in choosing or using lead pipe, call on NATIONAL. You'll get the benefit of our many years' experience in helping others select the correct piping for handling corrosive liquids.

NATIONAL supplies lead pipe and fittings in all types, sizes and weights. To meet various operating requirements, to handle various corrosive materials, NATIONAL offers lead-lined steel and cast iron pipe—as well as all-lead pipe.

NATIONAL LEAD is the leader in lead products. Its strategically-located plants and warehouses, its unexcelled sources of raw materials, its years of experience ... all contribute to the kind of service you expect from the leader.

So for lead pipe—or any other lead product—remember the leader is NATIONAL.

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NATIONAL LEAD COMPANY

New York 6; Atlanta; Baltimore 3; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; Dallas 2; Philadelphia 25; Pittsburgh 12; St. Louis 1; Boston 6 (National Lead Co. of Mass.); Los Angeles 23 (Morris P. Kirk & Son, Inc.); Toronto, Canada (Canada Metal Company, Limited)

When you buy agitating equipment, bear this in mind: hoopla, fanfare, and ballyhoo won't mix anything. Big build-ups are often followed by equally big let-downs.

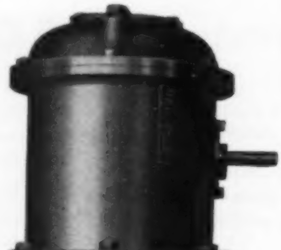
These simple rules can help you to get agitating equipment that won't let you down . . . that will serve you well and economically:

1 **Buy from a manufacturer who specializes in agitating equipment.**

2 **If possible buy equipment that's been used in applications similar to your own.**

3 **Buy what will save you money in the long run. Price tags are not necessarily a measure of agitating efficiency.**

4 **Buy from a manufacturer who backs his equipment with service.**



Model WT worm gear reduction drive.

For over forty years, Nettco *has* specialized in the design and manufacture of *Engineered* Agitating Equipment. We let our installations do our crowing for us. If you want good products backed by good service, contact NEW ENGLAND TANK & TOWER COMPANY, 87 Tileston St., Everett 49, Mass.

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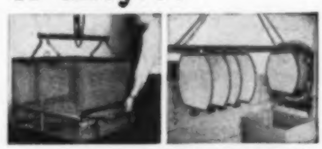
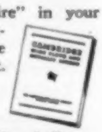
Why look further for special metal assemblies? Call *Cambridge* your approved source for properly designed crates, trays, baskets, racks or fixtures--expertly fabricated from any metal or alloy...



for processing your products or materials, in bulk, through liquids, heat, gases or corrosive agents.

Submit your own blueprints for quotation, or merely give us the details of the process for which the assembly must be designed. Our trained engineers and metalworkers will do the rest.

Look under "Baskets—Wire" in your Classified Telephone Directory to call your Cambridge Field Engineer, or write direct.



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These fittings—sold at same price as competing 150 lb. cast fittings — can be used where working pressures of up to 1000 lbs. are experienced.

These stainless steel fittings are available in Types 304, 316 and 347.

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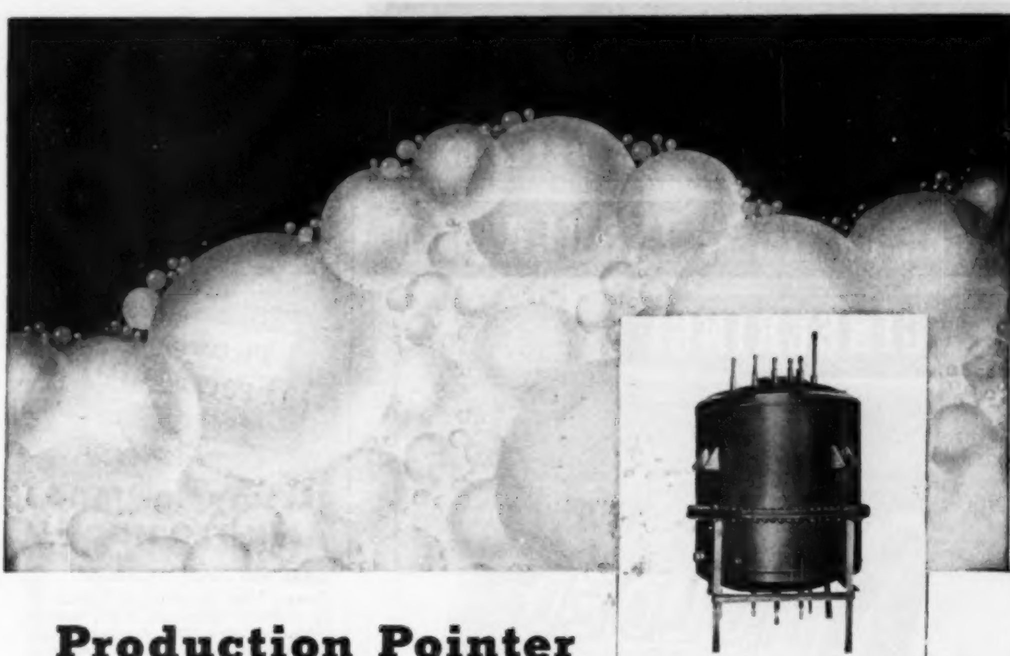

Production Pointer

. . . from a Glycerine Still

Extra productivity . . . reduced costs . . . or trouble-free performance . . . which interests you most? You'll find an idea on each in this case history . . . for it's typical of the results that creative equipment builders can offer by applying clad steels.

Delivering production improvement in spite of materials and manpower shortages is the prime contribution of progressive equipment builders. An important factor in this is the application of the Lukenomics principle. For Lukenomics combines their experience and that of designers and engineers with Lukens' specialized knowledge of materials and their application. This kind of cooperative ingenuity pays off for the equipment purchaser. We'll gladly put you in touch with equipment builders who apply the Lukenomics principle. Just write, stating your equipment problem, to Manager, Marketing Service, Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

With the defense program's having first call, you'll understand why Lukens specialty steel products for civilian use are not so plentiful as in normal times.

Modernization of a leading soap maker's glycerine distillation system called for increased production, new fuel economy and space conservation. New equipment included a still pot of Lukens Nickel-Clad Steel with solid nickel steam coils. Process involved crude with high salt content at 250°F, entering vessel under vacuum, and brought to 330°F. Design economically eliminates multiple distillation, providing faster heating, corrosion resistance, structural strength to withstand vacuum. Result: Production efficiency increased, fuel and maintenance reduced, equipment life lengthened. Using nickel-clad steel instead of solid nickel, the equipment builder effected a 71% saving of critical nickel and reduced equipment cost. *This is Lukenomics at work.*

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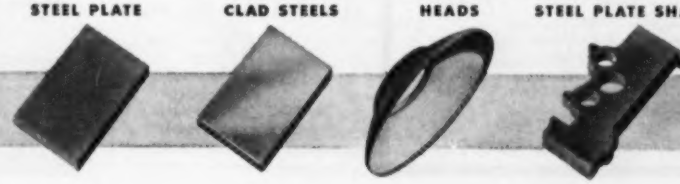
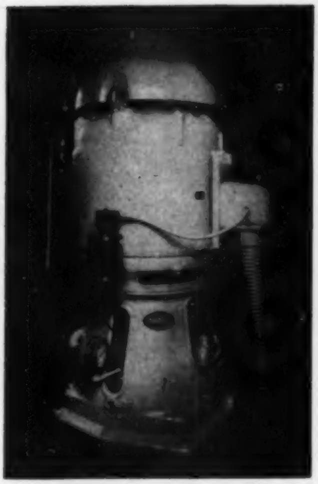
STEEL PLATE | CLAD STEELS | HEADS | STEEL PLATE SHAPES





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. . . from the smallest laboratory and pilot plant uses to heavy duty production line operation Sparkler has filters to fit the job.

For large installations where uninterrupted service of volume filtering is required, Sparkler filters are frequently engineered to operate in batteries; some production line installations have as many as twenty or more Sparkler filters operating together. Sparkler filters are made in a complete range of metals, stainless steel, mild steel, rubber lined, etc., steam jacketed and brine jacketed.

STANDARD MODELS ARE AVAILABLE MADE WITH THESE MECHANICAL SPECIFICATIONS:

Plate diameter sizes 8", 13½", 18", 33"
Filter area in one filter unit 1 sq. ft. to 200 sq. ft.
Cake space capacity 1 lb. to 300 lbs. of filter aid.
Flow rates from 10 G. P. H. to 48000 G. P. H. in one unit depending on viscosity of liquor.

For personal service and engineering consultation on your particular filtering problem, write Mr. Eric Anderson.

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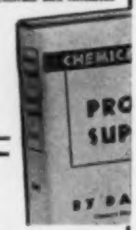

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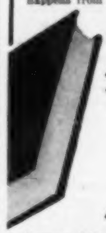

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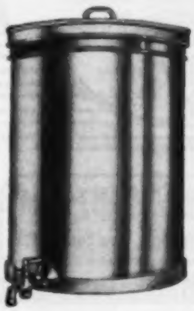

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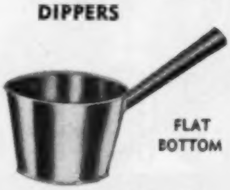

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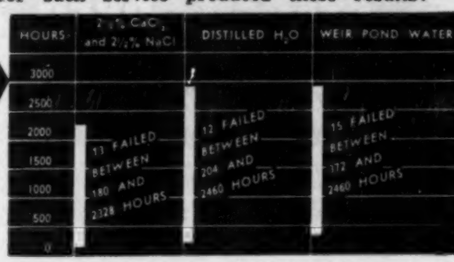

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2—MIKRO Pulverizers; Bantam size and #2 with 10 H.P. motor.
2—Dorr Classifiers, 2 deck, each with 5 H.P. motor and reducer.
3—Quaker City Hammer Mills, size M-20, each with 5 H.P. motor.
3—Ingersoll Rand Class ES, 18 x 7" Vacuum Pumps, 720 cfm; each with 25 H.P. A. C. motor and V-belt drive.
1—Dracco Dust Collector.
15—Mixing Tanks; 10' dia. x 7', 15 x 11', 10 x 8' with steam coils and agitators; 6 x 5', 7 x 7' with agitators.
700 Ft. Approximately—Screw Conveyor; steel encased, various lengths, motor drives.
Bucket Elevators, steel encased, various lengths, motor drives.
Many pumps, including LaBour alloy, Durimet, lead, stainless steel and other pumps.
Scales, Poidometers, Motors, etc.

All machines are direct motor driven, with 3/60/440-220 volt motors.

All machinery set up as recently operated

IMMEDIATE SHIPMENT

Here it is—your chance to get the machines you need at desirable prices. Everything must be out in 90 days. Come and get them now—while there is yet time.

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MODERN REBUILT PROCESS EQUIPMENT

UNION Rebuilt Machinery Established 1912

STILL AVAILABLE AT REAL BARGAIN PRICES

Capem Auto. BIF 4-Head Rotary Capper.

Stokes and Smith G1 and G4 Semi Automatic Auger Fillers.

Day 20 to 100 gal. Cincinnatus Double Arm Jacketed & Unjacketed Mixers.

Burt Automatic Wraparound Labelers.

Colton & Stokes Rotary Tablet Machines.

Triangle Pkg. Electri-Pak, G2C, G2S, A2C, N2CS and A6CA Fillers.

Triangle SHA Filler and Carton Sealer.

Stokes 90D Auto. Tube Filler & Closer.

Stokes 2C & Colton 4PF Cream Filler.

Filler 1, 2, 4, and 8 Head S.S. Fillers.

Stand Knapp No. 429 Carton Sealer.

B.P. Jumbo type, 3500 gal. Steam Jacketed Double Arm Mixer.

Fitzpatrick Stainless Steel D Comminuter.

Mikro 4TH, 2TH, 1SH and Bantam Pulverizers; Jay Bee 3AT & U1, Schutz O'Neill.

Baker Perkins and Readco Heavy Duty 50-150 gallon Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

F. J. Stokes, J. H. Day, New Era, Hottman Mixers, from 2 gallons up to 450 gallons, with and without Jackets, Single and Double Arm Agitators.

Lee 100 gal. Stainless Steel Jacketed Kettles.

15 gal. Pony Mixer.

Hahn Steam and Gas Fired Rotary Dryers.

Kent Three Roll Roller Mills, 12" x 30" and 16" x 40" sizes.

J. M. Lehmann 3 Roll 5" x 11" Lab Mill.

Three Roll 16" x 40" Porcelain Mill.

Houchin Aiken and N.E. Soap Mills.

Allis Chalmers, Great Western, Schutz O'Neill and Gayco Sifters.

Pony M, MX, ML and Auto. Duplex Labelrites; World Semi and Fully Automatic Rotary and Straightway Labelers.

Horix S. S. Rotary Fillers.

F. J. Stokes hand-operated Cream Filler, Closer and Crimper.

Sweetland, Vallez, Sperry, Shriver, Ertel, Johnson and Republic Filter Presses.

Scandia SSU1 and SFC Wrappers.

Miller MPS Semi-Auto. Wrapper.

Hayssen 3-7 Auto. Wrapper, electric eye.

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318-322 LAFAYETTE ST., NEW YORK 12, N.Y.

TOP PRICES PAID FOR YOUR SURPLUS EQUIPMENT

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1 Stokes #59A Vacuum Rotary Dryer, 18" x 42"

2 Double Drum Dryers 22" x 38"

1 Vacuum Pan Dryer 10' dia. x 3' deep

1 Tray Dryer, Atm., 1080 sq. ft.

1 Swenson Rotary Vacuum Filter, Precoat, 8' x 8', acid proof constr.

1 Sweetland #10 Filter, 47 monel leaves, 2" centers

8 Filter Presses, P&F, 12" to 30", Wood & C.I.

1 Davenport 3A Rotary Grains Press

2 Louisville 8-roll Continuous Grains Press, 24" and 36"

50 Stainless Clad Jacketed Kettles, open top, 30, 40, 60, 80, 100, 150 gal.

14 Stainless Steel Tanks, type 316: 30 gal., 80 gal., 300 gal., 400 gal.—closed

25 Glass Lined Steel Tanks, 7500 gal. & 8250 gal. Brewery lining

1 Deep Well Pump, 150 GPM—325' head, NEW

8 Ingersoll Rand bronze Centrifugal Pumps, #1½ CRVN, #1½ CRVNL—NEW

1 Ingersoll Rand bronze Centrifugal Pump #3ALV, 850 GPM at 140'—NEW

2 Spencer Turbine Co. Gas Boosters or Compressors, stainless steel, 600 CFM at 80 oz. pr.

2 Ammonia Compressors, 9 x 9, 7½ x 7½, 8 x 9

2 Worthington 6½ x 8 Vacuum Pumps

4 Selectro Vibrating Screens, 2' x 7', double deck, enclosed stainless

2 Copper Beer Still Columns, 24" & 30" dia.

2 Copper Rectifying Columns, 30" dia. and 36" dia.

2 Copper Gin Stills, 46 and 70 GPH

2 Read heavy duty double arm jacketed mixers, 200 gal. working cap., 1 Stainless Lined

1 W&P double arm sigma blade mixer, 100 gal. work. cap.

2 Abbe Eng. Pebble Mills size 1-B, 6' dia. x 8' long

1 Hardinge Conical Ball Mill, steel liner, 4'6" dia x 28" long

LIQUIDATING FORMER DISTILLERY & WINERY
Stills, boiler, pumps, wood tanks, etc.
Write for list.

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BOTTLING · CANNING · PROCESSING · MACHINERY · SUPPLIES
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RUGGLES COLES DRYERS
XB-10—70" x 35' Indirect Heat
XA—Double Shell, 48" x 30', 80" x 45' & 108" x 85'
XC-3—48" x 30' Steam
Single Shell: 4½ x 40, 6 x 35 & 7½ x 60

CHEMICAL EQUIPMENT
3—40" Centrifugal Extractors
6' x 48" Hardinge Air Swept Ball Mill
8' x 22" Hardinge Ball Mill, Drum Feed
5' x 22" Hardinge Ball Mill, Screw feed
#0 & #1 Raymond Automatic Pulverizer
4½ x 30 and 6' x 60' Rotary Kilns
3—8' x 12' Oliver Continuous Filters
4—11'6 x 14' Oliver Continuous Filters
2—8' x 4' Dorrco Continuous Filters
6—8'6—6 disc American Filters
1—6'-2 disc. American Filters
Giant Griffin Mill
Hercules Junior Mill
Clyde-Kuntz Continuous Hydrator
7 Elec. Air Compressors, 1300, 3100 & 3374 Ft.
135—8000 & 10,000 Gal. Tank Cars
45 Ton Plymouth Diesel Locomotive
40 Ton Orton Diesel Locomotive Crane
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For Sale **For Sale**

1 Day 150 Gal. Brighton Mixer.
5 Pebble Mills 40 to 500 Gal.
10 Pony Mixers 8, 15 and 40 Gal.
3 Steel Roller ink and Paint Mills. 9" by 25"—12" by 30"—16" by 40".
1 Eppenbach Homo-Mixer.
1 Motor driven portable belt conveyor.
1 W & P Double-Armed Lab. Mixer.
10 8" Premier Colloid Mills, Water-Cooled.

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TANKS

5,000 gallon to 10,000 barrel

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• GELB •

MOST-VALUE-FOR-YOUR-MONEY

2—Shriver 24" x 24" Plate & Frame Filter Presses, closed delivery 4 eyed washing type, 20 chambers ea.
1—FEINC Rotary String Filter, 4'6" x 6'.
1—Shriver Filter Press, 42" x 42", 46 Chambers, side-feed, open-delivery, washing type with hydraulic closing device.
1—Shriver Filter Press, 36" x 36", closed-delivery, side-feed, 25 Chambers.
1—Shriver Jacketed Plate & Frame, Filter Press, 36" x 36", 48 Chambers.
1—Sperry 36" x 36" Recessed Type Filter, centre-feed, open-delivery, 42 Heresite covered Plates.
1—Sperry Aluminum Filter Press 18" x 18", 9 Chambers

THE GELB GIRL FEBRUARY 1951

1—Stainless Steel Jacketed 300 gals. Kettle, 100 psi Jacket pressure.
3—Pfaudler Glass-Lined Jacketed Kettles, 300 gals. cap.
14—Pfaudler Glass-Lined Jacketed Kettles, 330 gals. cap.
3—Pfaudler Glass-Lined Jacketed Kettles, 300 gals. cap.
3—Pfaudler Glass-Lined Jacketed Kettles, 400 gals. cap.
1—Steel Jacketed Kettle, 2300 gals cap.
1—Stokes Vacuum Kettle with agitator 14"x 12".
1—Copper Jacketed Kettle, 6'x8' with agitator.
1—Cast-Iron Jacketed Reactor 1,500 gals. cap. with agitator.
1—Cast-Iron Jacketed Reactor 700 gals. cap.
6—Pfaudler Glass-Lined Jacketed Reactors 1,700 gals. cap.
1—Buffalo Jacketed Steel Vacuum Reactor 1,500 gals. cap. with agitator.
5—Rubber-Lined Storage Tanks 350 & 250 gals. cap.
5—Stainless Steel Storage Tanks 50, 100, 221 gals. cap.
1—Stainless Steel Clad Storage Tanks 3,100 gals. cap.
3—High Chrome Storage Tanks 3,800 & 6,000 gals. cap.
3—Pfaudler & Glascote, Glass-Lined Horizontal Storage Tanks, 200 gals. cap.
2—Black & Clawson Double Drum Dryers 28"x5'.
1—Ruggles Cole Direct Fired Kiln 8½'x60'.
1—Bartlett & Snow Direct Fired Kiln 8½'x50'.
1—Banbury Mixer #1 with 50 HP motor.
4—Baker Perkins Jacketed Vacuum Type Double Arm Mixers with Motors & Drives, 100 gals cap.
1—Cavagnarro Vacuum Type Double Arm Mixers with Motor & Drive, 100 gals. cap., Stainless Steel.
2—Cavagnarro Steel Jacketed Mixers, Chromium Plated, interior double arm, fishtail blades, 100 gals. cap., vacuum type with 40 HP Motors & Drives.
3—J. H. Day Double Arm Jacketed Mixers, 50 gals. cap., sigma blades.
1—Baker Perkins Laboratory Mixer, size #6.
1—Baker Perkins Double Arm Jacketed Mixer, 200 gals. cap., sigma blades.
3—Baker Perkins Double Arm Mixers, 200 gals. cap., sigma blades.
1—Patterson 5,000 gals. cap. Turbo Mixer "Unused".
2—J. H. Day Mogul Type Mixers, 2½ & 5 gals. cap.
5—Simpson #0 Intensive Mixers "Unused".
1—Simpson #1 Mixer.
3—Louisville Rotary Steam Tube Dryers, 6'x50'.
3—Buflovak Vacuum Shelf Dryers, 6, 12, & 15 Shelves.
3—Buflovak Flakers 5'x12'.
2—Buflovak Vacuum Drum Dryers, 24"x20".
2—Buflovak Vacuum Drum Dryers, 5'10"x10".
3—J. P. Devine Single Door Vacuum Shelf Dryers, 6 shelves.
1—Day Poney Mixer 15 gals. cap.
1—Gemco Copper Conical Blender, 3½ cu. ft.
10—Sweetland Filters, #12, 10, 7, 2, 1 & Laboratory Size.
3—Vallez Filters, #2E, 2B & 8.
10—Alsop Bronze & Brass Filters, Model # PAK 12-4.
3—Oliver Rotary Filters, 8'x10', 8'x12' & 3'x4'.
10—Sharples Super Pressurite Centrifuges #6.
1—Sharples Super Pressurite Centrifuges, Stainless Steel Bowl, Model #16Y.
1—Podbielniak Stainless Steel Centrifugal Extractor Model #8080.
1—Tolhurst Stainless Steel Suspended Centrifuge 40" Perforated Basket with 15 HP Motor.
10—Swenson-Walker Jacketed Crystalizers, 2'x2'x40' 10' sections.
1—Mikro Pulverizer #1SH.
1—Ball & Jewell Rotary Cutter #2.
1—Royle #1 Perfected Extruder, with heating unit.
1—Badger Stainless Steel Still with 12" Bubble Cap Column, 9 Plates, 25 sq. ft. Stainless Steel Condenser, Still Pot & Receiver.
1—American Locomotive Stainless Steel Heat Exchanger, Model Twin Double Pipe, Size 3½x2Tx24.
4—Steel Heat Exchangers, 800 sq. ft. each.
1—Struthers-Wells Stainless Steel Condenser, 570 sq. ft.
1—Allis Chalmers Tube Mill 3'8"x10', Silex-Lined.
3—Hardinge Conical Ball Mills 8'x30", 5'x22", 6'x22".
1—Abbe Engineering Silex-Lined Pebble Mill, 6'x12'.
1—Abbe Engineering Buhrstone-Lined Ball Mill, 5'x4'.
1—Ball Mill, Stone-Lined 7'x9'.
1—Blaw-Knox Jacketed Autoclave 3'x 4'2" with agitator.
1—High Pressure Steel Autoclave, 900 psi, 3'x4' with agitator and motor reducer.
1—J. H. Day #71 Ro-Ball Jacketed Stainless Steel Gyrating Screen Cooler.
2—Orville Simpson #41, Rotex Screens.
2—Wilson Pulsafeeders, Model #DELDO.

Established 1886

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

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CENTRIFUGALS

3—AT&M 60" center slung, S.S.
2—AT&M 48" Suspended, steel.
1—AT&M 48" Suspended, S.S.
2—Bird 40" Suspended, steel.
1—Tolhurst 32" Suspended, monel.
1—Tolhurst 32" Suspended, S.S.
1—AT&M 30" Suspended, S.S.
2—Tolhurst 20", rubber-covered.
2—Bird 36"x50", Solid Bowl, Continuous, rubber-covered.
2—Bird 36"x50", 36"x72" Solid Bowl, Continuous, steel.
3—Sharples #6, steel.

EVAPORATORS

3—Triple Effect, cast iron body, copper tubes, 13000, 9500, 5400 sq. ft.
7—Vacuum Pans 3 to 10' diameter, copper and steel.
3—Stainless Steel Vacuum Pans, 4', 5', 6'.

KETTLES—TANKS

6—2300 gal. steel jacketed agitated Kettles, 300#.
10—Stainless 30 to 500 gal., jacketed.
40—Steel Tanks Horizontal & Vertical, from 2000 to 650,000 gals.
1—32-gal. Horizontal rubber-lined Tank.
2—Buflovak 6' dia. Crystallizers.
1—2'x15' Jacketed Crystallizer.
25—Pfaudler Sectional glass-lined Tanks, 7500 gal., 8250 gal.
1—200 gal. Stainless, jktd. Agitated Kettle.
1—Stainless Steel Tank, Hor. 2500 gal.
6—Pfaudler 1000 to 3500 gal. jktd. glass-lined Mixing Tanks.
1—Patterson 150-gal. jktd. Autoclave, 300# pressure.

ROTARY KILNS AND DRYERS

1—Vulcan 10'x150', 5/8" Kiln.
2—Vulcan 9'x125', 3/4" Kiln.
1—Link Belt, 7'x45', ½" Kiln.
1—Link Belt, 5½"x20' Roto-Louvre Dryer.
1—Ruggles-Coles 90"x6' Rotary Dryer, ½" shell.
1—6'x48'9" Rotary Dryer, 1/4" shell, 1/16" monel.
1—4'x60' Rotary Dryer.
1—Kennedy-VanSaun 6'x40' Rotary Kiln.
1—Ruggles-Coles 4'x20' Indirect Heat Rotary Dryer.
4—Louisville Rotary Steam Tube Dryers 6'x30', 6'x25', 30"x20'.
1—Adt. 5'x35' Rotary Steam Tube Dryer.

FILTERS

2—Valley #40 Pressure Filters, 31 leaves.
3—Sweetland #12 Filters, 72 bronze leaves.
2—Sweetland #2 Stainless Steel, 12 leaves.
7—Oliver Rotary 11'6"x18', 8'x12', 8'x8', 5'4"x8', 3'x4', 3'x2', 1'x1'.
1—Swenson Rotary 4'x5'.
3—Shriver 42"x42" P&F, 40 chambers.
2—Sperry 36"x36" Recessed, 50 chambers.
2—Johnson 30"x30" P&F, 30 chambers.
1—Sperry Aluminum 30"x30" P&F, 28 chambers, with hydraulic closure.
2—Shriver 24"x24" Recessed, 30 chambers.
2—Sperry Type, 20"x20" Recessed, 25 chambers.
1—Sperry 24"x24" Bronze P&F, 22 chambers.
1—Shriver 12"x12" P&F, 12 chambers.
10—Shriver Skeletons, 18" to 42".

PULVERIZERS AND MILLS

3—Raymond 4-Roll, 3-Roll High Side Mills.
1—Raymond #45 Imp Mill.
1—Patterson 6'x16' Manganese Jacketed Ball Mill.
1—Abbe 5'x6' Manganese Jacketed Ball Mill.
5—Abbe 6'x8', 36"x42", 32"x36" Pebble Mills.
6—Patterson 4'x5', 3'x4' Pebble Mills.
2—Mikro Pulverizers #2DH, #1SH.
3—Colloid Mills 8", 4" dia., S.S.
1—Williams 20"x10" Hammer Mill.
1—Jeffrey 20"x12" Type B Hammer Mill.
5—Hardinge Mills 8'x22", 6'x22", 5'x36", 5'x22", 4½'x16".
3—Day 16"x40", 12"x30", 9"x24", 3-Roll Mills.
1—Raymond 6' Air Separator.
2—Simpson Intensive Mixers #1½, #0.

SCREENS

9—Rotex Screens 40"x84", 40"x120", 50"x120".
1—Robinson 40"x84" Stainless Single Deck.

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WESTERN SUGAR REFINERY

SAN FRANCISCO, CALIFORNIA

MAIN ITEMS

2—Triple Effect Evaporators, 13,000 sq. ft., 5400 sq. ft.
6—Single Effect Evaporators, C.I. bodies, copper tubes, 11 to 14' dia., to 1800 sq. ft.
3—All Copper Single Effect Evaporators, 8 to 14' dia., to 1800 sq. ft.
40—40" Centrifugals.
10—54" Centrifugals.
12—Tyler Hummer Screens 3' x 5'.
1—Sutton Steele & Steele Char Screening Separator.
8—#12 Sweetland Filters.
8—Hersey Rotary Dryers 6' x 25'.
62—Centrifugal Pumps 1" to 12".
56—Steam Driven Pumps.
10—Vacuum Pumps.
500—Motors ½ to 500 HP.
2—Turbo Generators 500 to 750 KW.
3—Pneumatic Scale Packaging Lines.
13—Tanks 5000 to 500,000 gals.
1—Nichols Herreshoff Furnace.

FULL DETAIL ON REQUEST.

WIRE—PHONE—WRITE

DRYERS—VACUUM AND ATMOSPHERIC

4—Stokes & Buffalo Rotary Vacuum, 18"x42", 30"x8', 3'x15', 5'x30'.
1—Buflovak Vacuum Shelf Dryer, 17 shelves, 42"x42".
1—P&S Conveyor Dryer 11' wide x 64' long.
5—Atmospheric Double Drum Dryers, 42"x120", 32"x100", 32"x90", 36"x84", 30"x52".
5—Single Drum Atmospheric, 5'x12', 4'x9', 4'x6'.
2—Devine 5'x12' Vacuum Drum.

MIXERS—ALL TYPES

2—Baker-Perkins 100 gal. Double Arm, sigma blades, steam jacketed.
3—Baker-Perkins 20, 9, ½-gal., steam jacketed, Double Arm.
1—Baker-Perkins 2 gal. S.S. Double Arm.
10—Day, Robinson 100# to 5000# Powder.
25—Electric Portable Agitators ¼ HP to 5 HP.
20—Rodgers Powder Mixers, 100 to 5000#.
2—Ross, Porter 40-gal. Pony Mixers.
3—80-100 gal. Lead Mixers.
9—Day Wall Mixers, 150 gal.
2—Simpson Intensive Mixers #1½ & #0.

MISCELLANEOUS

1—Stokes Vacuum Pump, 212 CFM.
1—Milton Roy Proportioneer Pump, S.S. and Hastelloy.
2—Worthington Vacuum Pumps 800 cfm.
9—Stokes Tablet Machines, ½" to 2½".
2—#1 and Duo Anderson Expellers.
4—Nash Hytor Vacuum Pumps to 300 CFM.
3—Olivite 2½" x 2" Centrifugal Pumps.
2—Durichlor 3 x 2", 4 x 3" Centrifugal Pumps.
5—Rodgers, Stokes & Smith Powder Fillers.
1—Knapp #429 Automatic Carton Sealer.
20—Belt, Screw & Bucket Conveyors.

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LIME KILNS
for
IMMEDIATE DELIVERY

8 vertical Lime Kilns, new and never erected. Block type. Each kiln has volume of approximately 100 tons raw materials and production capacity approximately 80 tons.

Further details on application to:

INTERNATIONAL YTONG COMPANY, AB.
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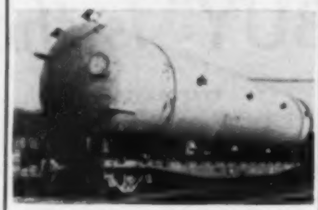

DEAERATOR TANKS ACID STORAGE TANKS

23 unused slat-filled cold water deaerator tanks, 11' in diameter by 56' long, 3/16" natural rubber lining, designed for 50# PSI internal pressure, ASME Code, capacity—40,000 gallons.

May be used as:

- Cold water wood slat deaerators
- Cold water wood slat scrubbers
- Acid storage (rubber lined)
- Gas absorption
- Gas extraction
- Storage of edible liquids
- Smoke and gas control

We also have available a large quantity of 6", 8", 14", and 18" steel pipe. Some pipe in the latter two sizes is rubber lined.

For specifications contact

GEORGE R. MARVIN COMPANY
1601 Taylor Way, Tacoma, Washington

IMMEDIATE SHIPMENT

Tanks, hoppers, up to 200 ton ice machine, stills, mills, blenders, mixers, dryers, kettles, conveyors, etc.

We own and offer a complete line of chemical processing and power machinery.

KAPLAN MACHINERY CO.
Tioga & Edgemont St.
Phila. 34, Pa. Ph. Ne-4-1210

ION EXCHANGE PLANT FOR SALE

Complete ion exchange unit of conventional design, including 117 ft³ of cation resin (Nalcite MX) and 78 ft³ of anion resin (Duolite A-3). Includes all rubber-lined tanks and piping, catwalks, 6-station Beckman model R pH meter, conductivity bridge model RC-1B, automatic controls, valve position indicators, Fisher and Porter flowrater, stainless steel heat exchanger with automatic controls, regenerant tanks, rubber-lined sump, etc. Complete with motors, pumps, and all auxiliary equipment for normal operation.

WYETH INCORPORATED
R. O. Phillips Mason, Michigan

FOR SALE

40 H.P. Dutton "Econotherm" Boiler.
100 gal. S.S. Clad Jkt. Kettles, 30" x 52"
100 to 500 gal. S.S. Mix Tanks, water jkt.
350 gal. S.S. Tank with s.s. coil
800 gal. S.S. Mix Tank, 71" x 38".
300 gal. Copper Tank, 47" x 38".
2—Stainless Steel Coils, 3", 8 turns.
20" to 72" S.S. Vacuum Pans.
28" x 60" to 32" x 120" Double Drum Dryers
4—50 gal. Steel Kettles, 75# jkt. A.S.M.E.
Premier Colloid Mill 6 in., 7½ H.P.
75 to 1500 gal. Homogenizers or Viscolizers.
30" to 60" Centrifugal Extractors.
Model 148C Stokes High Vacuum Pump, 1½ H.P.
Size B-3 Leiman Vac. Pumps, 12.7 C.F.M.
Hobart Grinder, 1½ H.P.
#12 Sweetland Filter.

Send us your inquiries

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1 East 42nd Street, New York 17, N. Y.
Murray Hill 2-4616

DRYERS—Vac. Shelf Stokes 30 x 36
Buffalo 42 x 42 - s/s
FILTERS—Bird Continuous, rubber lined 40" x 60".
Oliver 8' x 12', 11'6" x 14'.
Feinc 6'6" x 6'.
MILLS—Hardinge 5' x 36", 8' x 22".
KILNS—Rotary 4' x 45', 8'3" x 85'.
HAMMER MILLS and PULVERIZERS—JAW CRUSHERS

LAWLER COMPANY
Durham Avenue Metuchen, N. J.
Metuchen 6-0245

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COLUMNS

see our ad on page 394

ROTARY DRYER FOR SALE

Bartlett-Snow Rotary Dryer, 24"x13'. Complete every respect. Indirect oil fired. Very good condition.

FS-8902, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

PATTERSON PILOT PLANT

12 gal. Inconel Kettle, stainless condenser, receiver, decanter. Electrically heated Dowtherm for all temperatures. 1 HP explosion proof anchor agitator, variable speed. Complete with instruments and controls. Location North Jersey.

FS-8718, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

WEINSTEIN CO. HAS

STILLS

see our ad on page 394

BRAND NEW PFAUDLER

2000 Gal. Glass-Lined "R" Series Reactor Complete with Imp. Agit. with Hast. Sleeve; Hi Duty Stuff. Box; Tripod Drive Support; Hi Duty Drive; Thermowell; 5 HP motor; Hast. Dip Pipe; XP lgt. assy.; leg supports; Jktd. & insulated. Metropolitan Area.

FS-8787, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

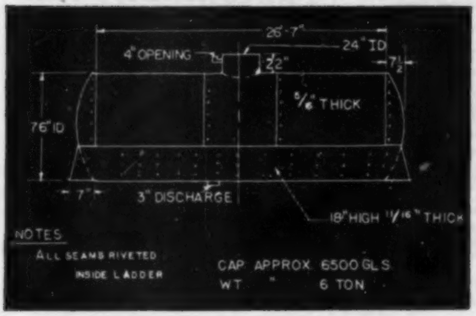
CENTRIFUGE FOR SALE

48" Bird Centrifuge, suspended type. Steel basket, imperforate. Good condition. No dealers.

FS-8829, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

FORTY STEEL STORAGE TANKS

6500 gals., 76" ID, 27' 10" overall, 11/16" & 5/16" shell, 5/16" heads



TANKS

350 gal. vert. 3'x6'6"x¼".
550 gal. hor. 3'x10'4"x⅜".
1000 gal. 4'6"x8'x½" hor.
1600 gal. vert. 8'x7'x3/16".
2100 gal. vert. 9'x6'6"x3/16".
2300 gal. 5'x17'x¼", SS.
3000 gal. 5'x20'x¼", hi-chrome.
6200 gal., hor., 6'x28'x⅜".
9200 gal., hor., 7'x30'x¼".
9600 gal., vert., 11'x13'9"x⅛".
15000 gal., vert., 10'6"x25'x¼".
15300 gal., hor., 9'x32'x5/16".
16200 gal. hor. 10'6"x25'x5/16".
17000 gal., hor., 9'6"x32'x¼".

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Oliver, 8'x10', 250 sq. ft., wood and steel.
Sweetland, size 12, steel, 72 leaves.

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36"x11', Haveg packed. (2 NEW).
72"x29'8", Bubble Cap, 21 trays, 18-8 SS. throughout.

BOILER

Walsh Widener, 620 HP., 450 PSI, ASME.

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300 & 400 amps. Hobart, all current models.
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3-Colton Tablet, type 200RP.

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Heat Exchangers, 16.5 sq. ft.
Pipe & Fittings—(Write for details).

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4'x60'x7/16" shell.
6'x14'x9/16" shell.
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AT&M, 60" solid bowl, SS.
Bird, 36"x50", cont., rubber and SS.

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Filter: Sweetland-12 24" leaves 4" o. c.
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Filter: Oliver 3'x2' continuous.
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Vacuum Dryers: Stokes 55-BB, 20 shelves.
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Powder Mixers: 100 to 2000 lb. capacities.
Centrifugal: Rochester 30" suspended.
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Screen: Tyler-Hummer 3' x 10'.
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see our ad on page 394

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1—Buffalo Vac Drum Dryer 24x20". Also Rotary Vac. Dryers.
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12—Sharples Centrifuges #3A Stainless. Also #6.
3—De Laval Multiple Clarifiers #200, 300 & 301.

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2—12" Bronze & Rubber Filter Presses. Extra 30" Iron Sperry Plates & Frames.

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2—Double Roll Crushers 10" dia. x 14" face.
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5—Lehman & Kent 3 Roll Steel Mills, 6" x 14", 8" x 22", 9" x 32", 12" x 30" & 16" x 40".
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6—Rotex Sifters 20"x30" to 40"x84".

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WEINSTEIN CO. HAS
BOILERS
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NEW REFRACTORY DOES THE "IMPOSSIBLE"

Unusual properties of NORTON FUSED STABILIZED ZIRCONIA start new processing era

AGAIN . . . Norton Research opens the doors to new technical advances in the processing field. First to produce Fused Stabilized Zirconia in commercially significant quantities, Norton now makes it possible for you to lift your process-temperature ceiling up to 4500°F.

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WRITE FOR DATA. In Technical Bulletin SZ1, Norton researchers and refractory engineers give you all the up-to-the-minute facts about Fused Stabilized Zirconia. Get your copy . . . use the coupon below today.

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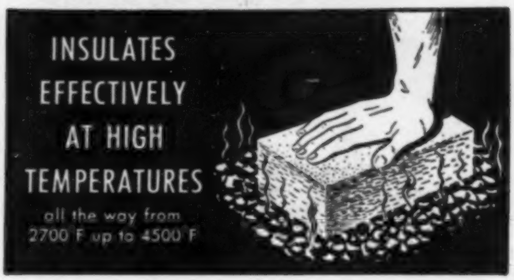

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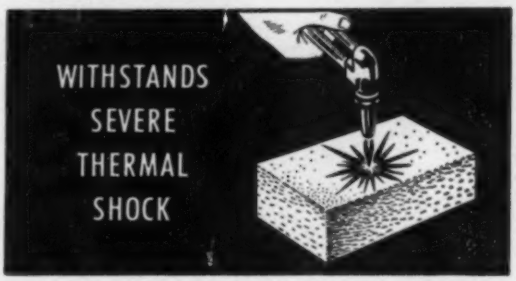

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☐ Lining Furnaces or Reactors ☐ Batts for Firing Titanates
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TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are two indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised. The index of advertisers is on the proceeding page.

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Advertisements:—There is a page number on the postcard for each advertisement. Before the number, may appear, L, R, T, B (left, right, top, bottom) locating the ad on the page; small letters following (a, b, c) indicate additional products in the advertisement.

Editorial Items:—Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in three editorial departments: Equipment News, New Products, and New Literature.

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